S

s: *Abbreviation for* **second.**

safety service: Any radiocommunication service used permanently or temporarily for the safeguarding of human life and property. [NTIA] [RR]

sampling: *See* **signal sampling.**

sampling frequency: *See* **sampling rate.**

sampling interval: The reciprocal of the sampling rate, *i.e.*, the interval between corresponding points on two successive sampling pulses of the sampling signal.

sampling rate: The number of samples taken per unit time, *i.e.*, the rate at which signals are sampled for subsequent use, such as for modulation, coding, and quantization. *Deprecated synonym* **sampling frequency.** (188)

sampling theorem: *Synonym* **Nyquist's theorem.**

satellite: A body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body. [NTIA] [RR] (188) *Note:* A parent body and its satellite revolve about their common center of gravity.

satellite access: In satellite communications systems, the establishment of contact with a communications satellite space station. *Note:* An example of satellite access is access at the moment at which an Earth station commences to use a satellite space station as a signal repeater, *i.e.*, to use its transponder. Each radio frequency (rf) carrier that is relayed by a satellite space station at any time occupies an access channel. Accesses, *i.e.*, channels, are distinguishable by various system parameters, such as frequency, time, or code. [From Weik '89]

satellite communications: A telecommunications service provided via one or more satellite relays and their associated uplinks and downlinks. (188)

satellite Earth terminal: *Synonym* **Earth terminal.**

satellite emergency position-indicating radiobeacon: An Earth station in the mobile-satellite service the emissions of which are intended to facilitate search and rescue operations. [RR]

satellite link: A radio link between a transmitting Earth station and a receiving Earth station through one satellite. A satellite link comprises one uplink and one downlink. [NTIA] [RR]

satellite network: A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating Earth stations. [RR]

satellite operation: *See* **satellite PBX.**

satellite PBX: A PBX system that is not equipped with attendant positions, and is associated with an attended main PBX system. *Note:* The main attendant provides attendant functions for the satellite system.

satellite period: *See* **period (of a satellite).**

satellite relay: An active or passive satellite repeater that relays signals between two Earth terminals. (188)

satellite system: A space system using one or more artificial Earth satellites. [NTIA] [RR]

saturation: **1.** In a communications system, the condition in which a component of the system has reached its maximum traffic handling capacity. *Note:* Saturation is equivalent to one erlang per circuit. **2.** The point at which the output of a linear device, such as a linear amplifier, deviates significantly from being a linear function of the input when the input signal is increased. (188) *Note:* Modulation often requires that amplifiers operate below saturation.

scan: **1.** To examine sequentially, part by part. **2.** To examine every reference in every entry in a file routinely as part of a retrieval scheme. **3.** In radar, one complete rotation of the interrogating antenna. **4.** In SONAR, to search 360° or a specific search sector by the use of phased array of transducers. **5.** To sweep, *i.e.*, rotate, a beam about a point or about an axis.

scan line: 1. The line produced on a recording medium frame by a single sweep of a scanner. [JP1] **2.** *Synonym* **scanning line.**

scanner: A device that examines a spatial pattern, one part after another, and generates analog or digital signals corresponding to the pattern. *Note:* Scanners are often used in mark sensing, pattern recognition, and character recognition. (188)

scanning: 1. In telecommunications systems, examination of traffic activity to determine whether further processing is required. *Note:* Scanning is usually performed periodically. **2.** In television, facsimile, and picture transmission, the process of successively analyzing the colors and densities of the object according to a predetermined pattern. (188) **3.** The process of tuning a device through a predetermined range of frequencies in prescribed increments and at prescribed times. *Note:* Scanning may be performed at regular or random increments and intervals. (188) **4.** In radar and radio direction finding, the slewing of an antenna or radiation pattern for the purpose of probing in a different direction. *Note 1:* In radar, scanning may be mechanical, using a rotary microwave joint to feed the antenna, or electronic, using a phased array of radiators, the radiated pattern (beam) of which depends on the relative phases of the signals fed to the individual radiators. *Note 2:* In civilian air traffic control radar, scanning usually implies continuous rotation of the antenna or beam about a vertical axis. In military radars, scanning may occur about other than a vertical axis, and may not encompass a full 360°.

scanning direction: In facsimile transmitting equipment, the scanning of an object, such as a message surface or the developed plane in the case of a drum, along parallel lines in a specified pattern. *Note 1:* The scanning direction is equivalent to scanning over a right-hand helix on a drum. *Note 2:* The orientation of the message on the scanning plane will depend upon its dimensions. *Note 3:* In facsimile receiving equipment, scanning from right to left and top to bottom, is called "positive" reception and from left to right and top to bottom, is called "negative" reception. (188) *Note 4:* Scanning direction conventions are included in CCITT Recommendations for phototelegraphic equipment.

scanning field: In facsimile systems, the total of the areas that are actually explored by the scanning spot during the scanning of the object by the transmitter or during scanning of the record medium by the receiver. [From Weik '89]

scanning line: In an imaging system, the path traversed by a scanning spot during a single line sweep.

scanning line frequency: In facsimile, the frequency at which a fixed line perpendicular to the direction of scanning is crossed by a scanning spot. (188) *Note:* The scanning line frequency is equivalent to drum speed in some mechanical systems. *Synonym* **scanning line rate.**

scanning line length: In facsimile systems, the total length of a scanning line, equal to the spot speed divided by the scanning line frequency. (188) *Note:* The scanning line length is usually greater than the length of the available line.

scanning line period: In facsimile systems, the time interval between (a) the instant at which the scanning spot probes or writes to a given spot on one scanning line, and (b) the instant at which the scanning spot probes or writes to the corresponding spot on the next scanning line.

scanning line rate: *Synonym* **scanning line frequency.**

scanning pitch: The distance between the centers of consecutive scanning lines.

scanning rate: In facsimile and television systems, the rate of displacement of the scanning spot along the scanning line. (188)

scanning spot: In facsimile systems, the area on the object, *i.e.*, the original, covered instantaneously by the pickup system of the scanner. (188)

scan-stop lockup: In automatic link establishment (ALE) radios, the undesired condition in which the normal process of (a) scanning radio channels, (b) stopping on the desired channel, or (c) returning to scan is terminated by the equipment.

scatter: *See* **scattering.**

scattering: Of a wave propagating in a material medium, a phenomenon in which the direction, frequency, or polarization of the wave is changed when the wave encounters discontinuities in the medium, or interacts with the material at the atomic or molecular level. (188) *Note:* Scattering results in a disordered or random change in the incident energy distribution.

scattering center: In the microstructure of a transmission medium, a site at which electromagnetic waves are scattered. *Note 1:* Examples of scattering centers are vacancy defects; interstitial defects; inclusions, such as a gas molecules, hydroxide ions, iron ions, and trapped water molecules; and microcracks or fractures in dielectric waveguides. *Note 2:* Scattering centers are frozen in the medium when it solidifies and may not necessarily cause Rayleigh scattering, which varies inversely as the fourth power of the wavelength. For example, in glass optical fibers, there is a high attenuation band at 0.95 µm, primarily caused by scattering and absorption by OH^- (hydroxyl) ions. [From Weik '89]

scattering coefficient: The factor that expresses the attenuation caused by scattering, *e.g.*, of radiant or acoustic energy, during its passage through a medium. *Note:* The scattering coefficient is usually expressed in units of reciprocal distance.

scattering cross section: The area of an incident wavefront, at a reflecting surface or medium, such as an object in space, through which will pass radiant energy, that, if isotropically scattered from that point, would produce the same power at a given receiver as is actually provided by the entire reflecting surface. [From Weik '89]

scattering loss: The part of the transmission (power) loss that results from scattering within a transmission medium or from roughness of a reflecting surface. (188)

SCC: *Abbreviation for* **specialized common carrier.**

scene cut: Video imagery in which consecutive frames are highly uncorrelated.

scene cut response: In video systems, the perceived impairments associated with a scene cut.

schematic: 1. A diagram, drawing, or sketch that details the elements of a system, such as the elements of an electrical circuit or the elements of a logic diagram for a computer or communications system. **2.** Pertaining to a diagram, drawing, or sketch that details the elements of a system, such as the elements of an electrical circuit or the elements of a logic diagram for a computer or communications system.

scintillation: In electromagnetic wave propagation, a small random fluctuation of the received field strength about its mean value. (188) *Note:* Scintillation effects become more significant as the frequency of the propagating wave increases.

scrambler: A device that transposes or inverts signals or otherwise encodes a message at the transmitter to make the message unintelligible at a receiver not equipped with an appropriately set descrambling device. (188) *Note:* Scramblers usually use a fixed algorithm or mechanism. However, a scrambler provides communications privacy that is inadequate for classified traffic.

screen: 1. In a telecommunications, computing, or data processing system, to examine entities that are being processed to determine their suitability for further processing. **2.** A nonferrous metallic mesh used to provide electromagnetic shielding. (188) **3.** To reduce undesired electromagnetic signals and noise by enclosing devices in electrostatic or electromagnetic shields. (188) **4.** A viewing surface, such as that of a cathode ray tube or liquid crystal display (LCD).

scroll: In a display device, to move the display window of the screen vertically to view the contents of a stored document. *Note:* Scrolling may be performed continuously or incrementally. (188)

SDLC: *Abbreviation for* **synchronous data link control.**

search time: In data processing systems, the time interval required to locate a particular data element, record, or file in a storage device.

SECAM: *Acronym for* **système electronique couleur avec memoire.** A television signal standard (625 lines, 50 Hz, 220 V primary power) used in France,

eastern European countries, the former USSR, and some African countries.

second (s): In the International System of Units (SI), the time interval equal to 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom. (188)

secondary channel: In a system in which two channels share a common interface, a channel that has a lower data signaling rate (DSR) capacity than the primary channel.

secondary emission: Particles or radiation, such as photons, Compton recoil electrons, delta rays, secondary cosmic rays, and secondary electrons, that are produced by the action of primary radiation on matter. (188)

secondary frequency standard: A frequency standard that does not have inherent accuracy, and therefore must be calibrated against a primary frequency standard. *Note:* Secondary standards include crystal oscillators and rubidium standards. A crystal oscillator depends for its frequency on its physical dimensions, which vary with fabrication and environmental conditions. A rubidium standard is a secondary standard even though it uses atomic transitions, because it takes the form of a gas cell through which an optical signal is passed. The gas cell has inherent inaccuracies because of gas pressure variations, including those induced by temperature variations. There are also variations in the concentrations of the required buffer gases, which variations cause frequency deviations.

secondary radar: A radiodetermination system based on the comparison of reference signals with radio signals retransmitted from the position to be determined. [NTIA] [RR] *Note:* An example of secondary radar is the transponder-based surveillance of aircraft. *Synonym* **secondary surveillance radar.**

secondary radiation: *See* **secondary emission.**

secondary service area: [T]he service area of a broadcast station served by the skywave and not subject to objectionable interference and in which the signal is subject to intermittent variations in strength. [47CFR]

secondary station: In a communications network, a station that (a) is responsible for performing unbalanced link-level operations as instructed by the primary station and (b) interprets received commands and generates responses.

secondary surveillance radar: *Synonym* **secondary radar.**

secondary time standard: A time standard that requires periodic calibration against a primary time standard.

second dialtone: 1. Dialtone presented to the call originator after an access code has been dialed for access to a second, outside, telecommunications system or service. **2.** Dialtone returned to the call originator after she/he has dialed an access number and has reached a switch providing access to modem, to a fax machine, to another telephone, *etc.*

second window: Of silica-based optical fibers, the transmission window at approximately 1.3 µm. *Note:* The second window is the minimum-dispersion window in silica-based glasses. [After FAA]

SECORD: *Acronym for* **secure voice cord board**. A desk-mounted patch panel that provides the capability for controlling (a) sixteen 50-kb/s wideband or sixteen 2400-b/s narrowband user lines and (b) 5 narrowband trunks to DSN or other narrowband facilities. (188)

SECTEL: *Acronym for* **secure telephone.** *See* **STU.**

sector: A predetermined, addressable angular part of a track or band on a magnetic drum or magnetic disk.

sectoring: In magnetic or optical disk storage media, the division of tracks into a specified number of segments, for the purpose of organizing the data stored thereon.

secure communications: Telecommunications deriving security through use of type 1 products and/or protected distribution systems. [NIS]

secure telephone unit: *See* **STU.**

secure transmission: 1. In transmission security, *see* **secure communications**. **2.** In spread-spectrum systems, the transmission of binary coded sequences that represent information that can be recovered only by persons or systems that have the proper key for the spread-spectrum code-sequence generator, *i.e.*, have a synchronized generator that is identical to that used for transmission. [From Weik '89]

secure voice cord board: *See* **SECORD.**

security: 1. A condition that results from the establishment and maintenance of protective measures that ensure a state of inviolability from hostile acts or influences. [JP1] **2.** With respect to classified matter, the condition that prevents unauthorized persons from having access to official information that is safeguarded in the interests of national security. [After JP1] **3.** Measures taken by a military unit, an activity or installation to protect itself against all acts designed to, or which may, impair its effectiveness. [JP1]

security filter: 1. In communications security, the hardware, firmware, or software used to prevent access to specified data by unauthorized persons or systems, such as by preventing transmission, preventing forwarding messages over unprotected lines or circuits, or requiring special codes for access to read-only files. [From Weik '89] **2.** [An] AIS trusted subsystem that enforces security policy on the data that passes through it. [NIS]

security kernel: 1. In computer and communications security, the central part of a computer or communications system hardware, firmware, and software that implements the basic security procedures for controlling access to system resources. **2.** A self-contained usually small collection of key security-related statements that (a) works as a part of an operating system to prevent unauthorized access to, or use of, the system and (b) contains criteria that must be met before specified programs can be accessed. **3.** Hardware, firmware, and software elements of a trusted computing base that implement the reference monitor concept. [NIS]

security management: In network management, the set of functions (a) that protects telecommunications networks and systems from unauthorized access by persons, acts, or influences and (b) that includes many subfunctions, such as creating, deleting, and controlling security services and mechanisms; distributing security-relevant information; reporting security-relevant events; controlling the distribution of cryptographic keying material; and authorizing subscriber access, rights, and privileges. (188)

seek: To position selectively the access mechanism of a direct access [storage] device.

seek time: The time required for the access arm of a direct-access storage device to be positioned on the appropriate track. *Synonym* **positioning time.**

segment: In a distributed queue dual bus (DQDB) network, a protocol data unit (PDU) that (a) consists of 52 octets transferred between DQDB-layer peer entities as the information payload of a slot, (b) contains a header of 4 octets and a payload of 48 octets, and (c) is either a pre-arbitrated segment or a queued arbitrated segment.

segmented encoding law: An encoding law in which an approximation to a curve defined by a smooth encoding law is obtained by a number of linear segments. *Synonym* **piecewise linear encoding law.**

segregation: *Synonym* **privacy (def. #1).**

seizing: The temporary dedication of various parts of a communications system to a specific use, usually in response to a user request for service. (188) *Note:* The parts seized may be automatically connected, such as by direct distance dialing (DDD), or may require operator intervention.

seizure signal: In telephone systems, a signal used by the calling end of a trunk or line to indicate a request for service. (188) *Note:* A seizure signal also locks out the trunk or line to other demands for service.

selcall: *Acronym for* **selective calling.** Calling from one station in which call identification is sent to signal automatically one or more remote stations and to establish links among them. (188) *Note 1:* Selective calling may be used to un-mute the speakers at designated stations or to initiate a handshake for link

establishment. *Note 2:* Selective calling is specified in CCIR Recommendations for HF and VHF/UHF radio, generally for ship-to-shore, ship-to-ship, aircraft-to-aircraft, and aircraft-to-ground communications.

selection position: *Synonym* **decision instant.**

selective calling: *See* **selcall.**

selective combiner: *Synonym* **maximal-ratio combiner.**

selective fading: Fading in which the components of the received radio signal fluctuate independently. (188)

selective jamming: *See* **electronic warfare.**

selective ringing: In a party line, ringing only the desired user instrument. (188) *Note:* Without selective ringing, all the instruments on the party line will ring at the same time, selection being made by the number of rings.

selectivity: A measure of the ability of a receiver to discriminate between a wanted signal on one frequency and unwanted signals on other frequencies. (188)

self-authentication: **1.** A procedure in which a transmitting station, *i.e.*, a calling station, establishes its own validity without the participation of the receiving station, *i.e.*, the called station. *Note:* The calling station establishes its own authenticity and the called station is not required to challenge the calling station. Self-authentication is usually used only when one-time authentication systems are used to derive the authentication. [From Weik '89] **2.** Implicit authentication, to a predetermined level, of all transmissions on a secure communications system. [NIS]

self-delineating block: A block in which a bit pattern or a flag identifies the beginning or end of a block.

self-synchronizing code: A code in which the symbol stream formed by a portion of one code word, or by the overlapped portion of any two adjacent code words, is not a valid code word. (188) *Note 1:* A self-synchronizing code permits the proper framing of transmitted code words provided that no uncorrected errors occur in the symbol stream. *Note 2:* External synchronization is not required. *Note 3:* High-level data link control (HDLC) and Advanced Data Communication Control Procedures (ADCCP) frames represent self-synchronizing code words.

semiautomated tactical command and control system: A machine-aided command and control system in which human intervention is required in varying degrees to operate the system.

semiautomatic switching system: **1.** In telephone systems, a switching system in which telephone operators receive call instructions orally from users and complete them by automatic equipment. (188) **2.** At tape-relay intermediate stations, the manual routing or rerouting of taped messages without rekeying them. (188)

semiconductor laser: *Synonym* **injection laser diode.**

semiduplex operation: **1.** A method which is simplex operation at one end of the circuit and duplex operation at the other. *RR Footnote:* In general, duplex operation and semiduplex operation require two frequencies in radiocommunication; simplex operation may use either one or two. [NTIA] [RR] **2.** Operation of a communications network in which a base station operates in a duplex mode with a group of remote stations operating in a half-duplex mode. (188) *Note:* The terms *"half-duplex"* and *"simplex"* are used differently in wire and radio communications.

sender: A device that accepts address information from a register or routing information from a translator, and then transmits the proper routing information to a trunk or to local equipment. *Note:* Sender and register functions are often combined in a single unit. (188)

sending-end crossfire: In teletypewriter (TTY) systems, interference, in a given channel, caused by transmissions from one or more adjacent TTY channels transmitting from the end at which the crossfire, *i.e.*, interference, is measured. (188)

sensitive information: Information, the loss, or misuse, or unauthorized access to or modification of

which could adversely affect the national interest or the conduct of federal programs, or the privacy to which individuals are entitled to under 5 U.S.C. Section 552a (the Privacy Act), but that has not been specifically authorized under criteria established by an Executive Order or an Act of Congress to be kept secret in the interest of national defense or foreign policy. [NIS]

sensitivity: In an electronic device, *e.g.*, a communications system receiver, or detection device, *e.g.*, PIN diode, the minimum input signal required to produce a specified output signal having a specified signal-to-noise ratio, or other specified criteria. (188) *Note 1:* The signal input may be expressed as power in dBm or as field strength in microvolts per meter, with input network impedance stipulated. *Note 2: "Sensitivity"* is sometimes improperly used as a synonym for *"responsivity."*

sensor: A device that responds to a physical stimulus, such as thermal energy, electromagnetic energy, acoustic energy, pressure, magnetism, or motion, by producing a signal, usually electrical.

sentinel: *See* **flag.**

separate channel signaling: Signaling in which the whole or a part of one or more channels in a multichannel system is used to provide for supervisory and control signals for the message traffic channels. (188) *Note:* The same channels, such as frequency bands or time slots, that are used for signaling are not used for message traffic. *Contrast with* **common-channel signaling.**

septet: A byte composed of seven binary elements. *Synonym* **seven-bit byte.**

sequence: An arrangement of items according to a specified set of rules, for example, items arranged alphabetically, numerically, or chronologically.

sequential access: *Synonym* **serial access.**

sequential logic element: A device that has at least one output channel and one or more input channels, all characterized by discrete states, such that the state of each output channel is determined by the previous states of the input channels.

sequential transmission: *Synonym* **serial transmission.**

serial: **1.** Pertaining to a process in which all events occur one after the other; for example, the serial transmission of the bits of a character according to the CCITT V.25 protocol. **2.** Pertaining to the sequential or consecutive occurrence of two or more related activities in a single device or channel. **3.** Pertaining to the sequential processing of the individual parts of a whole, such as the bits of a character or the characters of a word, using the same facilities for successive parts.

serial access: **1.** Pertaining to the sequential or consecutive transmission of data into or out of a device, such as a computer, transmission line, or storage device. (188) **2.** A process by which data are obtained from a storage device or entered into a storage device in such a way that the process depends on the location of those data and on a reference to data previously accessed. *Synonym* **sequential access.**

serial computer: **1.** A computer that has a single arithmetic and logic unit. **2.** A computer, some specified characteristic of which is serial; for example, a computer than manipulates all bits of a word serially.

serializer: *See* **parallel-to-serial conversion.**

serial port: A port through which data are passed serially, *i.e.*, one bit at a time, and that requires only one input channel to handle a set of bits, *e.g.*, all the bits of a byte. *Contrast with* **parallel port.**

serial-to-parallel conversion: Conversion of a stream of data elements received in time sequence, *i.e.*, one at a time, into a data stream consisting of multiple data elements transmitted simultaneously. *Contrast with* **parallel-to-serial conversion.**

serial transmission: The sequential transmission of the signal elements of a group representing a character or other entity of data. *Note:* The characters are transmitted in a sequence over a single line, rather than simultaneously over two or more lines, as in parallel transmission. The sequential elements may be transmitted with or without

interruption. (188) *Synonym* **sequential transmission.**

series T junction: A three-port waveguide junction that has an equivalent circuit in which the impedance of the branch waveguide is predominantly in series with the impedance of the main waveguide at the junction.

server: A network device that provides service to the network users by managing shared resources. *Note 1:* The term is often used in the context of a client-server architecture for a local area network (LAN). *Note 2:* Examples are a printer server and a file server.

service: In the Open Systems Interconnection—Reference Model (OSI—RM), a capability of a given layer, and the layers below it, that (a) is provided to the entities of the next higher layer and (b) for a given layer, is provided at the interface between the given layer and the next higher layer.

service access: In personal communications service (PCS), the ability for the network to provide user access to features and to accept user service requests specifying the type of bearer services or supplementary service that the users want to receive from the PCS network.

service access point (SAP): 1. A physical point at which a circuit may be accessed. (188) **2.** In an Open Systems Interconnection (OSI) layer, a point at which a designated service may be obtained.

service bit: A system overhead bit used for providing a network service, such as a request for a repetition or for a numbering sequence. (188) *Note:* A service bit is not a check bit.

service channel: *Synonym* **orderwire circuit.**

service class: *See* **class of service.**

service data unit (SDU): In layered systems, a set of data that is sent by a user of the services of a given layer, and is transmitted to a peer service user semantically unchanged.

service feature: In telephony, any of a number of special functions that may be specified initially, or added to, the user's basic service. (188) *Note:* Modern telephone switches are capable of providing a wide variety of service features, such as call forwarding and call waiting.

service identification: The information that uniquely identifies an NS/EP telecommunications service to the service vendor and the service user.

service integrity: The degree to which a service is provided without excessive impairment, once obtained. [NATO]

service probability: The probability of obtaining a specified (or higher) grade of service during a given period of time. (188)

service profile: *Synonym* **UPT service profile.**

service profile management: *Synonym* **UPT service profile management.**

service program: *Synonym* **utility program.**

service routine: *Synonym* **utility program.**

service signals: Signals that enable data systems equipment to function correctly, and possibly to provide ancillary facilities. *Synonym* **housekeeping signals.**

service termination point: The last point of service rendered by a commercial carrier under applicable tariffs. *Note 1:* The service termination point is usually on the customer premises. *Note 2:* The customer is responsible for equipment and operation from the service termination point to user end instruments. *Note 3:* The service termination point usually corresponds to the demarcation point.

service user: An individual or organization, including a service vendor, that is provided a telecommunications service for which a priority level has been requested or assigned.

Session Layer: *See* **Open Systems Interconnection—Reference Model.**

set: 1. A finite or infinite number of objects, entities, or concepts, that have a given property or properties

in common. **2**. To configure all or part of a device into a specified state.

seven-bit byte: *Synonym* **septet.**

seven-hundred (700) service: A personal telephone service that allows individuals to receive, via a single number, telephone calls in various locations (*e.g.*, home, office, or car) from call originators using the same common carrier.

sexadecimal: *Synonym* **hexadecimal.**

sextet: A byte composed of six binary elements. *Synonym* **six-bit byte.**

S-F: *Abbreviation for* **store-and-forward.**

SF: *Abbreviation for* **single-frequency.** *See* **single-frequency signaling.**

SFTS: *Abbreviation for* **standard frequency and time signal.** *See* **standard time and frequency signal service.**

SGML: *Abbreviation for* **Standard Generalized Mark-up Language.** A file format for storage of text and graphics files.

shadow loss: 1. The attenuation caused to a radio signal by obstructions in the propagation path. (188) **2.** In a reflector antenna, the relative reduction in the effective aperture of the antenna caused by the masking effect of other antenna parts, such as a feed horn or a secondary reflector, which parts obstruct the radiation path. (188)

shannon (Sh): The unit of information derived from the occurrence of one of two equiprobable, mutually exclusive, and exhaustive events. *Note:* A bit may, with perfect formatting and source coding, contain 1 Sh of information. However, the information content of a bit is usually be less than 1 Sh.

Shannon's law: A statement defining the theoretical maximum rate at which error-free digits can be transmitted over a bandwidth-limited channel in the presence of noise, usually expressed in the form $C = W \log_2(1 + S/N)$, where C is the channel capacity in bits per second, W is the bandwidth in hertz, and S/N is the signal-to-noise ratio. (188) *Note:* Error-correction codes can improve the communications performance relative to uncoded transmission, but no practical error correction coding system exists that can closely approach the theoretical performance limit given by Shannon's law.

shaping network: A network inserted in a circuit for the purpose of improving or modifying the waveform of signals. (188)

sheath: Of a communications or power cable, the outer covering or coverings of tough material, often plastic, that is resistant to environmental hazards such as abrasion, liquid intrusion, solar radiation, *etc.*, and is used to protect cable component(s) such as optical fibers or metallic conductors that transport the signal or power. *Note:* There may be more than one sheath surrounding a given cable. For example, some cable designs use an inner sheath surrounded by metallic armor, over which is an outer sheath. *Synonym* **jacket.**

sheath miles: The actual length of cable in route miles. [47CFR]

shell: In a computer environment, an operating system command interpreter, *i.e.*, a software utility that reads an input specifying an operation, and that may perform, direct, or control the specified operation. *Note 1:* For example, a shell may permit a user to switch among application programs without terminating any of them. *Note 2:* A shell may take its input from either a user terminal or from a file.

SHF: *Abbreviation for* **super high frequency.** *See* **electromagnetic spectrum.**

shield: 1. A housing, screen, sheath, or cover that substantially reduces the coupling of electric, magnetic, or electromagnetic fields into or out of circuits or transmission lines. (188) **2.** A protective cover that prevents the accidental contact of objects or persons with parts or components operating at hazardous voltage levels. (188)

shielded pair: A 2-wire transmission line surrounded by a sheath of conductive material that protects it from the effects of external fields and confines fields produced within the line. (188)

shielded twisted pair: A transmission line composed of a twisted 2-wire metallic transmission line surrounded by a sheath of conductive material that protects it from the effects of external fields and confines fields produced within the line. (188)

shielding: *See* **shield.**

shielding effectiveness: The factor that expresses the attenuation caused by scattering, *e.g.*, of radiant or acoustic energy, during its passage through a medium. *Note:* The scattering coefficient is usually expressed in units of reciprocal distance.

shift: 1. The movement of some or all of the characters or bits of a word by the same number of character or bit positions in the direction of a specified end of a word. **2.** In radar, the ability to move the origin of a radial display away from the center of the cathode ray tube.

shift register: A storage device, usually in a central processing unit (CPU), in which device a serially ordered set of data may be moved, as a unit, into a discrete number of storage locations. (188) *Note 1:* Shift registers may be configured so that the stored data may be moved in more than one direction. *Note 2:* Shift registers may be configured so that data may be entered and stored from multiple inputs. *Note 3:* Shift registers may be grouped into arrays of two or more dimensions in order to perform more complex data operations.

ship Earth station: A mobile Earth station in the maritime mobile-satellite service located on board ship. [NTIA] [RR]

ship's emergency transmitter: A ship's transmitter to be used exclusively on a distress frequency for distress, urgency or safety purposes. [NTIA] [RR]

ship station: A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station. [NTIA] [RR]

shock excitation: *Synonym* **impulse excitation.**

short haul toll traffic: A general term applied to message toll traffic between nearby points. In common usage, this term is ordinarily applied to message toll traffic between points less than 20 to 50 miles apart. [47CFR]

shortwave: In radio communications, pertaining to the band of frequencies approximately between 3 MHz and 30 MHz. *Note: "Shortwave"* is not a term officially recognized by the international community.

short wavelength: In optical communication, optical radiation having a wavelength less than approximately 1 µm.

shot noise: The noise caused by random fluctuations in the motion of charge carriers in a conductor. (188) *Note:* There is often a minor inconsistency in referring to shot noise in an optical system: many authors refer to shot noise loosely when speaking of the mean square shot noise current (amperes^2) rather than noise power (watts).

SI: *Abbreviation for* **International System of Units.**

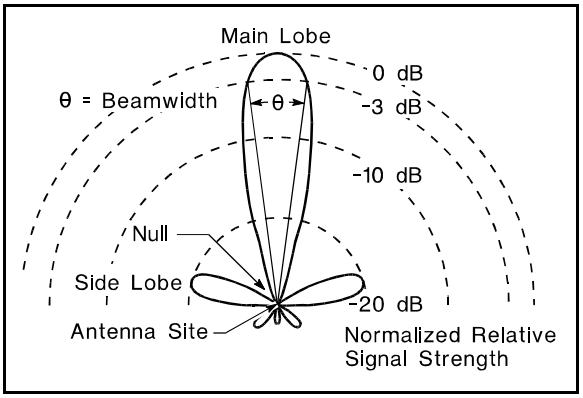
SID: *Abbreviation for* **sudden ionospheric disturbance.**

sideband: In amplitude modulation (AM), a band of frequencies higher than or lower than the carrier frequency, containing energy as a result of the modulation process. (188) *Note:* Amplitude modulation results in two sidebands. The frequencies above the carrier frequency constitute what is referred to as the *"upper sideband";* those below the carrier frequency, constitute the *"lower sideband."* In conventional AM transmission, both sidebands are present. Transmission in which one sideband is removed is called *"single-sideband transmission."*

sideband transmission: *See* **single-sideband transmission.**

side circuit: Either of the two circuits used to derive a phantom circuit. (188)

side lobe: In a directional antenna radiation pattern, a lobe in any direction other than that of the main lobe. (188)



side lobe

sidetone: The sound of the speaker's own voice (and background noise) as heard in the speaker's telephone receiver. (188) *Note:* Sidetone volume is usually suppressed relative to the transmitted volume. *Synonym* **telephone sidetone.**

SIGINT: *Acronym for* **signals intelligence.**

signal: 1. Detectable transmitted energy that can be used to carry information. **2.** A time-dependent variation of a characteristic of a physical phenomenon, used to convey information. **3.** As applied to electronics, any transmitted electrical impulse. [JP1] **4.** Operationally, a type of message, the text of which consists of one or more letters, words, characters, signal flags, visual displays, or special sounds, with prearranged meaning and which is conveyed or transmitted by visual, acoustical, or electrical means. [JP1]

signal center: A combination of signal communication facilities operated by the Army in the field and consisting of a communications center, telephone switching central and appropriate means of signal communications. [JP1]

signal compression: 1. In analog (usually audio) systems, reduction of the dynamic range of a signal by controlling it as a function of the inverse relationship of its instantaneous value relative to a specified reference level. (188) *Note 1:* Signal compression is usually expressed in dB. *Note 2:* Instantaneous values of the input signal that are low, relative to the reference level, are increased, and those that are high are decreased. *Note 3:* Signal compression is usually accomplished by separate devices called *"compressors."* It is used for many purposes, such as (a) improving signal-to-noise ratios prior to digitizing an analog signal for transmission over a digital carrier system, (b) preventing overload of succeeding elements of a system, or (c) matching the dynamic ranges of two devices. *Note 4:* Signal compression (in dB) may be a linear or nonlinear function of the signal level across the frequency band of interest and may be essentially instantaneous or have fixed or variable delay times. *Note 5:* Signal compression always introduces distortion, which is usually not objectionable, if the compression is limited to a few dB. *Note 6:* The original dynamic range of a compressed signal may be restored by a circuit called an *"expander."* (188) **2.** In facsimile systems, a process in which the number of pels scanned on the original is larger than the number of encoded bits of picture information transmitted. (188)

signal contrast: In facsimile, the ratio of the level of the white signal to the level of the black signal. (188) *Note:* Signal contrast is usually expressed in dB.

signal conversion equipment: *Synonym* **modem.**

signal distance: 1. A measure of the difference between a given signal and a reference signal. *Note:* For analog signals, the signal distance is the root mean square difference between the given signal and a reference signal over a symbol period. **2.** *Synonym* **Hamming distance.**

signal distortion: *See* **distortion.**

signal droop: In an otherwise essentially flat-topped rectangular pulse, distortion characterized by a decline of the pulse top. *See illustration under* **waveform.**

signal element: A part of a signal, distinguished by its nature, magnitude, duration, transition, or relative position. *Note:* Examples of signal elements include signal transitions, significant conditions, significant instants, and binary digits (bits). (188)

signal expansion: Restoration of the dynamic range of a compressed signal. *Contrast with* **signal compression.**

signal frequency shift: *See* **frequency shift.**

signaling: 1. The use of signals for controlling communications. **2.** In a telecommunications network, the information exchange concerning the establishment and control of a connection and the management of the network, in contrast to user information transfer. (188) **3.** The sending of a signal from the transmitting end of a circuit to inform a user at the receiving end that a message is to be sent. (188)

signaling path: In a transmission system, a path used for system control, synchronization, checking, signaling, and service signals used in system management and operations rather than for the data, messages, or calls of the users. (188)

signaling rate: *See* **data signaling rate.**

Signaling System No. 7 (SS7): A common-channel signaling system defined by the CCITT in the 1988 Blue Book, in Recommendations Q.771 through Q.774. *Note:* SS7 is a prerequisite for implementation of an Integrated Services Digital Network (ISDN).

signaling time slot: In TDM carrier systems, a time slot starting at a particular phase or instant in each frame and allocated to the transmission of signaling (supervisory and control) data. (188)

signal intelligence: *See* **signals intelligence.**

signal level: In a communications system, the signal power or intensity at a specified point and with respect to a specified reference level, *e.g.*, 1 mW.

signal message: In communications systems, a message, *i.e.*, an assembly of signaling information, that (a) includes associated message alignment and service indications, (b) pertains to a call, and (c) is transferred via the message transfer part.

signal-plus-noise-plus-distortion to noise-plus-distortion ratio: *See* **SINAD.**

signal-plus-noise-to-noise ratio ($(S+N)/N$): At a given point in a communications system, the ratio of (a) the power of the desired signal plus the noise to (b) the power of the noise. *Note:* The $(S+N)/N$ ratio is usually expressed in dB. (188)

signal processing: The processing—such as detection, shaping, converting, coding, and time positioning—of signals, that results in their transformation into other forms, such as other waveshapes, power levels, and coding arrangements.

signal processing gain: 1. The ratio of (a) the signal-to-noise ratio of a processed signal to (b) the signal-to-noise ratio of the unprocessed signal. *Note:* Signal processing gain is usually expressed in dB. **2.** In a spread-spectrum communications system, the signal gain, signal-to-noise ratio, signal shape, or other signal improvement obtained by coherent band spreading, remapping, and reconstitution of the desired signal.

signal reference subsystem: The portion of a facility grounding system that (a) provides reference planes, such as ground-return circuits, for all of the signal paths in the facility and (b) is isolated from other circuits, especially isolated from circuits that carry fault, lightning discharge, and power distribution currents.

signal regeneration: Signal processing that restores a signal so that it conforms to its original characteristics. (188)

signal-return circuit: A current-carrying return path from a load back to the signal source, *i.e.*, the low side of the closed loop energy transfer circuit between a source-load pair. (188)

signal sample: The value of a particular characteristic of a signal at a chosen instant. (188)

signal sampling: The process of obtaining a sequence of instantaneous values of a particular signal characteristic, usually at regular time intervals. (188)

signal security: A generic term that includes both communications security and electronics security. [JP1]

signals intelligence (SIGINT): 1. A category of intelligence comprising, either individually or in combination, all communications intelligence, electronics intelligence, and foreign instrumentation signals intelligence, however transmitted. [JP1] **2.** Intelligence derived from communications,

electronics, and foreign instrumentation signals. [JP1]

signals security: [A] generic term encompassing communications security and electronic security. [NIS]

signal-to-crosstalk ratio: At a specified point in a circuit, the ratio of the power of the wanted signal to the power of the unwanted signal from another channel. *Note 1:* The signals are adjusted in each channel so that they are of equal power at the zero transmission level point in their respective channels. *Note 2:* The signal-to-crosstalk ratio is usually expressed in dB. (188)

signal-to-noise ratio (SNR): The ratio of the amplitude of the desired signal to the amplitude of noise signals at a given point in time. [JP1] *Note 1:* SNR is expressed as 20 times the logarithm of the amplitude ratio, or 10 times the logarithm of the power ratio. *Note 2:* SNR is usually expressed in dB and in terms of peak values for impulse noise and root-mean-square values for random noise. In defining or specifying the SNR, both the signal and noise should be characterized, *e.g.,* peak-signal-to-peak-noise ratio, in order to avoid ambiguity.

signal-to-noise ratio per bit: The ratio given by E_b/N_0, where E_b is the signal energy per bit and N_0 is the noise energy per hertz of noise bandwidth. (188)

signal transfer point (STP): In a common-channel signaling network, a switching center that provides for the transfer from one signaling link to another. *Note:* In nonassociated common-channel signaling, the signal transfer point need not be the point through which the call, which is associated with the signaling being switched, passes.

signal transition: In the modulation of a carrier, a change from one significant condition to another. *Note 1:* Examples of signal transitions are a change from one electrical current, voltage, or power level to another; a change from one optical power level to another; a phase shift; or a change from one frequency or wavelength to another. *Note 2:* Signal transitions are used to create signals that represent information, such as “0” and “1” or “mark” and “space.”

signature: 1. The complete set of electromagnetic and/or acoustic signals received, *e.g.*, from an infrared source, a radio or radar transmitter, an aircraft, or a ship. *Note:* Signatures may consist of analog or digital signals, or both, and may be analyzed to indicate the nature of their source and assist in its recognition. **2.** The attributes of an electromagnetic or acoustic wave that has been reflected from or transmitted through an object and contains information indicating the attributes of the object.

significant condition: In the modulation of a carrier, one of the values of the signal parameter chosen to represent information. (188) *Note 1:* Examples of significant conditions are an electrical current, voltage, or power level; an optical power level; a phase value; or a frequency or wavelength chosen to represent a “0” or a “1”; or a “mark” or a “space.” *Note 2:* The duration of a significant condition is the time interval between successive significant instants. *Note 3:* A change from one significant condition to another is called a *“signal transition.” Note 4:* Signal transitions are used to create signals that represent information, such as “0” and “1” or “mark” and “space.” *Note 5:* Significant conditions are recognized by an appropriate device. Each significant instant is determined when the appropriate device assumes a condition or state usable for performing a specific function, such as recording, processing, or gating.

significant digit: In a representation of a number, a digit that is needed for a given purpose; in particular, a digit that must be kept to preserve a given accuracy or a given precision.

significant instant: In a signal, any instant at which a significant condition of a signal begins or ends. (188) *Note:* Examples of significant instants include the instant at which a signal crosses the baseline or reaches 10% or 90% of its maximum value.

significant interval: The time interval between two consecutive significant instants. (188)

silent zone: *Synonym* **skip zone.**

silica: Silicon dioxide (SiO_2). *Note 1:* Silica may occur in crystalline or amorphous form, and occurs naturally in impure forms such as quartz and sand. *Note 2:* Silica is the basic material of which the most

common communication-grade optical fibers are presently made. [After FAA]

silicon dioxide (SiO_2): *See* **silica**.

silicon photodiode: A silicon-based PN- or PIN-junction photodiode. *Note 1:* Such photodiodes are useful for direct detection of optical wavelengths shorter than approximately 1 µm. *Note 2:* Because of their greater bandgap, silicon-based photodiodes are quieter than germanium-based photodiodes, but germanium photodiodes must be used for wavelengths longer than approximately 1 µm. [FAA]

simple buffering: The assigning of buffer storage for the duration of the execution of a computer program.

Simple Mail Transfer Protocol (SMTP): The Transmission Control Protocol/Internet Protocol (TCP/IP) standard protocol that facilitates transfer of electronic-mail messages, specifies how two systems are to interact, and specifies the format of messages used to control the transfer of electronic mail.

Simple Network Management Protocol (SNMP): The Transmission Control Protocol/Internet Protocol (TCP/IP) standard protocol that (a) is used to manage and control IP gateways and the networks to which they are attached, (b) uses IP directly, bypassing the masking effects of TCP error correction, (c) has direct access to IP datagrams on a network that may be operating abnormally, thus requiring management, (d) defines a set of variables that the gateway must store, and (e) specifies that all control operations on the gateway are a side-effect of fetching or storing those data variables, *i.e.*, operations that are analogous to writing commands and reading status.

simple scanning: In facsimile transmission, scanning using only one spot at a time. (188)

simplex circuit: 1. A circuit that provides transmission in one direction only. (188) **2.** *Deprecated definition:* A circuit using ground return and affording communication in either direction, but in only one direction at a time. *Note:* The above two definitions are contradictory; however, both are in common use. The user is cautioned to verify the nature of the service specified by this term.

simplex operation: 1. Operation in which transmission occurs in one and only one preassigned direction. *Synonym* **one-way operation.** (188) *Note:* Duplex operation may be achieved by simplex operation of two or more simplex circuits or channels. **2.** Operating method in which transmission is made possible alternately in each direction of a telecommunication channel, for example by means of manual control. *Note:* In general, duplex operation and semiduplex operation require two frequencies in radiocommunication; simplex operation may use either one or two. [NTIA] [RR] *Note 2:* These two definitions are contradictory, however, both are in common use. The first one is used in telephony and the second one is used in radio. The user is cautioned to verify the nature of the service specified by this term.

simplex (SX) signaling: Signaling in which two conductors are used for a single channel, and a center-tapped coil, or its equivalent, is used to split the signaling current equally between the two conductors. (188) *Note:* SX signaling may be one-way, for intra-central-office use, or the simplex legs may be connected to form full duplex signaling circuits that function like composite (CX) signaling circuits with E & M lead control.

simulate: To represent certain features of the behavior of a physical or abstract system by the behavior of another system. *Note 1:* For example, delay lines may be used to simulate propagation delay and phase shift caused by an actual transmission line. *Note 2:* A simulator may imitate only a few of the operations and functions of the unit it simulates. *Contrast with* **emulate.**

SINAD: *Abbreviation for* **signal-plus-noise-plus-distortion to noise-plus-distortion ratio. 1.** The ratio of (a) total received power, *i.e.*, the received signal-plus-noise-plus-distortion power to (b) the received noise-plus-distortion power. (188) **2.** The ratio of (a) the recovered audio power, *i.e.*, the original modulating audio signal plus noise plus distortion powers from a modulated radio frequency carrier to (b) the residual audio power, *i.e.*, noise-plus-distortion powers remaining after the original modulating audio signal is removed. (188) *Note:* The SINAD is usually expressed in dB.

singing: An undesired self-sustained audio oscillation in a circuit. *Note:* Singing is usually caused by positive feedback, excessive gain, or unbalance of a hybrid termination, or by some combination of these. (188)

singing margin: The difference in power levels between the singing point and the operating gain of a system or component. (188)

singing point: The threshold point at which additional gain in the system will cause self-oscillation. (188)

single-current system: *Synonym* **neutral direct-current telegraph system.**

single-current transmission system: *Synonym* **neutral direct-current telegraph system.**

single-ended control: *Synonym* **single-ended synchronization.**

single-ended synchronization: Synchronization between two locations, in which phase error signals used to control the clock at one location are derived by comparing the phase of the incoming signals to the phase of the internal clock at that location. *Synonym* **single-ended control.**

single-frequency interference: Interference caused by a single-frequency source. *Note 1:* An example of single-frequency interference is interference in a transmission channel induced by a 60-Hz source. (188) *Note 2:* The interference caused by the single-frequency source may have other frequencies and may also appear in many channels.

single-frequency (SF) signaling: In telephony, signaling in which dial pulses or supervisory signals are conveyed by a single voice-frequency tone in each direction. (188) *Note 1:* An SF signaling unit converts E & M signaling to a format (characterized by the presence or absence of a single voice-frequency tone), which is suitable for transmission over an ac path, *e.g.*, a carrier system. The SF tone is present in the idle state and absent during the seized state. In the seized state, dial pulses are conveyed by bursts of SF tone, corresponding to the interruptions in dc continuity created by a rotary dial or other dc dialing mechanism. *Note 2:* The SF tone may occupy a small portion of the user data channel spectrum, *e.g.*, 1600 Hz or 2600 Hz ("in-band" SF signaling), usually with a notch filter at the precise SF frequency, to prevent the user from inadvertently disconnecting a call if user data has a sufficiently strong spectral content at the SF frequency. The SF tone may also be just outside the user voice band, *e.g.*, 3600 Hz. *Note 3:* The Defense Data Network (DDN) transmits dc signaling pulses or supervisory signals, or both, over carrier channels or cable pairs on a 4-wire basis using a 2600-Hz signal tone. The conversion into tones, or vice versa, is done by SF signal units.

single-harmonic distortion: Of a fundamental frequency, the ratio of the power of a specified harmonic to the power of the fundamental frequency. *Note:* Single-harmonic distortion is measured at the output of a device under specified conditions and is expressed in dB. (188)

single-mode fiber: *Synonym* **single-mode optical fiber.**

single-mode optical fiber: An optical fiber in which only the lowest order bound mode can propagate at the wavelength of interest. *Note 1:* The lowest order bound mode is ascertained for the wavelength of interest by solving Maxwell's equations for the boundary conditions imposed by the fiber, *e.g.*, core (spot) size and the refractive indices of the core and cladding. *Note 2:* The solution of Maxwell's equations for the lowest order bound mode will permit a pair of orthogonally polarized fields in the fiber, and this is the usual case in a communication fiber. *Note 3:* In step-index guides, single-mode operation occurs when the normalized frequency, V, is less than 2.405. For power-law profiles, single-mode operation occurs for a normalized frequency, V, less than approximately

$$2.405\sqrt{\frac{g+2}{g}},$$

where g is the profile parameter. *Note 4:* In practice, the orthogonal polarizations may not be associated with degenerate modes. *Synonyms* **monomode optical fiber, single-mode fiber, single-mode optical waveguide, unimode fiber.**

single-mode optical waveguide: *Synonym* **single-mode optical fiber.**

single-Morse system: *Synonym* **neutral direct-current telegraph system.**

single-polarized antenna: An antenna that radiates or receives radio waves with a specific polarization. *Note:* For a singly polarized antenna, the desired sense of polarization is usually maintained only for certain directions or within the major portion of the radiation pattern. (188)

single-sideband (SSB) emission: An amplitude modulated emission with one sideband only. [NTIA] [RR] (188)

single-sideband (SSB) equipment reference level: The power of one of two equal tones that, when used together to modulate a transmitter, cause it to develop its full rated peak power output. (188)

single-sideband suppressed carrier (SSB-SC) transmission: Single-sideband transmission in which the carrier is suppressed. (188) *Note:* In SSB-SC the carrier power level is suppressed to the point where it is insufficient to demodulate the signal.

single-sideband (SSB) transmission: Sideband transmission in which only one sideband is transmitted. (188) *Note:* The carrier may be suppressed.

single-tone interference: An undesired discrete frequency appearing in a transmission channel. (188) *Note:* The single-tone interference frequency is the frequency that appears in the channel regardless of the nature of the source.

sink: **1.** An absorber of energy. **2.** In communications, a device that receives information, control, or other signals from a source. (188)

S interface: For basic rate access in an Integrated Services Digital Network (ISDN) environment, a user-to-network interface reference point that (a) is characterized by a 4-wire, 144-kb/s (2B+D) user rate, (b) serves as a universal interface between ISDN terminals or terminal adapters and the network channel termination, (c) allows a variety of terminal types and subscriber networks, such as PBXs, local area networks (LANs), and controllers, to be connected to the network, and (d) operates at 4000 48-bit frames per second, *i.e.*, 192 kb/s, with a user portion of 36 bits per frame, *i.e.*, 144 kb/s.

six-bit byte: *Synonym* **sextet.**

skew: **1.** In parallel transmission, the difference in arrival time of bits transmitted at the same time. (188) **2.** For data recorded on multichannel magnetic tape, the difference between reading times of bits recorded in a single transverse line. (188) *Note:* Skew is usually interpreted to mean the difference in reading times between bits recorded on the tracks at the extremities, *i.e.*, edges, of the tape. **3.** In facsimile systems, the angular deviation of the received frame from rectangularity caused by asynchronism between the scanner and the recorder. *Note:* Skew is expressed numerically as the tangent of the deviation angle. (188) **4.** In facsimile, the angle between the scanning line, or recording line, and the perpendicular to the paper path.

skew ray: In a multimode optical fiber, a bound ray that travels in a helical path along the fiber and thus (a) is not parallel to the fiber axis, (b) does not lie in a meridional plane, and (c) does not intersect the fiber axis.

skin effect: The tendency of alternating current to flow near the surface of a conductor, thereby restricting the current to a small part of the total cross-sectional area and increasing the resistance to the flow of current. *Note:* The skin effect is caused by the self-inductance of the conductor, which causes an increase in the inductive reactance at high frequencies, thus forcing the carriers, *i.e.*, electrons, toward the surface of the conductor. At high frequencies, the circumference is the preferred criterion for predicting resistance than is the cross-sectional area. The depth of penetration of current can be very small compared to the diameter. [From Weik '89]

skip distance: At a given azimuth, the minimum distance between the transmitting station and the closest point of return to the Earth of a transmitted wave reflected from the ionosphere. (188)

skip zone: An annular region within the transmission range of an antenna, within which signals from the

transmitter are not received. *Note:* The skip zone is bounded by the locus of the farthest points at which the ground wave can be received and the nearest points at which reflected sky waves can be received. (188) *Synonyms* **silent zone, zone of silence.**

sky wave: A radio wave that travels upward from the antenna. (188) *Note:* A sky wave may be reflected to Earth by the ionosphere.

slab-dielectric waveguide: An electromagnetic waveguide (a) that consists solely of dielectric materials, (b) in which the dielectric propagation medium has a rectangular cross section, (c) that has a width, thickness, and refractive indices that determine the operating wavelength and the modes the guide will support beyond the equilibrium length, (d) that may be cladded, protected, distributed, and electronically controllable, and (e) that may be used in various applications, such as in integrated optical circuits (IOCs) in which their shape is geometrically more convenient than the optical fibers that are circular in cross section, that are used in fiber optic cables for long-distance transmission. *Note:* Their principle of operation is the same as that for optical fibers that are circular in cross section. [After 2196]. *Synonym* **planar waveguide.**

slant range: The line-of-sight distance between two points, not at the same level relative to a specific datum. [JP1] (188) *Note:* An example of slant range is the distance to an airborne radar target, *e.g.*, an airplane flying at high altitude with respect to that of the radar antenna. The slant range is the hypotenuse of the triangle represented by the altitude of the airplane and the distance between the radar antenna and the airplane's ground track (the point on the Earth at which it is directly overhead). In the absence of altitude information, the aircraft location would be plotted farther from the antenna than its actual ground track.

slave clock: A clock that is coordinated with a master clock. *Note 1:* Slave clock coordination is usually achieved by phase-locking the slave clock signal to a signal received from the master clock. *Note 2:* To adjust for the transit time of the signal from the master clock to the slave clock, the phase of the slave clock may be adjusted with respect to the signal from the master clock so that both clocks are in phase. Thus, the time markers of both clocks, at the output of the clocks, occur simultaneously.

slave station: 1. In a data network, a station that is selected and controlled by a master station. *Note:* Usually a slave station can only call, or be called by, a master station. **2.** In navigation systems using precise time dissemination, a station having a clock is synchronized by a remote master station. *Synonym* **subordinate station.**

slewing: 1. Rotating a directional antenna or transducer rapidly about one or more axes. **2.** Changing the frequency or pulse repetition rate of a signal source. **3.** Changing the tuning of a receiver, usually by sweeping through many or all frequencies. [From Weik '89] **4.** Redirecting the beam of a fixed antenna array by changing the relative phases of the signals feeding the antenna elements.

sliding window: A variable-duration window that allows a sender to transmit a specified number of data units before an acknowledgement is received or before a specified event occurs. *Note:* An example of a sliding window in packet transmission is one in which, after the sender fails to receive an acknowledgement for the first transmitted packet, the sender "slides" the window, *i.e.*, resets the window, and sends a second packet. This process is repeated for the specified number of times before the sender interrupts transmission. *Synonym (loosely)* **acknowledgement delay period.**

slip: In a sequence of transmitted symbols, *e.g.*, digital bits, a signal phase shift, *i.e.*, a signal positional displacement, that causes the loss of one or more symbols or the insertion of one or more extraneous symbols. *Note:* Slips are usually caused by inadequate synchronization of the two clocks controlling the transmission and reception of the signals that represent the symbols.

SLIP: *Acronym for* **serial line Internet protocol.** A protocol that allows a computer to use the Internet protocol (IP) with a standard telephone line and a high-speed modem.

slip-free operation: Operation of a communications system with sufficient phase-locking to avoid overflowing or emptying buffers. (188)

slit source: *Synonym* **line source.**

slope: In a transmission line, the rate of change of attenuation with respect to frequency over the frequency spectrum. (188) *Note 1:* The slope is usually expressed in dB per hertz or dB per octave. *Note 2:* In metallic lines, the slope is usually greater at high frequencies than at low frequencies.

slope equalizer: A device or circuit used to achieve a specified slope in a metallic transmission line. (188)

slope-keypoint compaction: Data compaction accomplished by stating (a) a specific keypoint of departure, (b) a direction or slope of departure, (c) the maximum deviation from a prescribed specific value, and (d) a new keypoint and a new slope. *Note:* An example of slope-keypoint compaction is the storage or transmission of a slope and one point on a straight line instead of storing and transmitting a large number of values, *i.e.*, of points, on the line. [From Weik '89]

slot: In a distributed-queue dual-bus (DQDB) network, a protocol data unit (PDU) that (a) consists of 53 octets used to transfer segments of user information, (b) has the capacity to contain a segment of 52 octets and a 1-octet access control field, and (c) may be either a pre-arbitrated (PA) slot or a queued arbitrated (QA) slot.

slot antenna: A radiating element formed by a slot in a conducting surface or in the wall of a waveguide. (188)

slotted-ring network: A ring network that allows unidirectional data transmission between data stations by transferring data in predefined slots in the transmission stream over one transmission medium such that the data return to the originating station.

slot time: In networks using carrier sense multiple access with collision detection (CSMA/CD), the length of time that a transmitting station waits before attempting to retransmit following a collision. *Note:* Slot time varies from station to station.

SMDR: *Abbreviation for* **station message-detail recording.**

smearing: In video displays, a localized distortion over a sub-region of the image, characterized by reduced sharpness of edges and spatial detail.

smooth Earth: Idealized surfaces, such as water surfaces or very level terrain, having radio horizons that are not formed by prominent ridges or mountains but are determined solely as a function of antenna height above ground and the effective Earth radius. (188)

SNA: *Abbreviation for* **systems network architecture.** A proprietary communications architecture.

sneak current: In a communications circuit, an anomalous current that presents no immediate danger, but may cause improper operation or damage. (188)

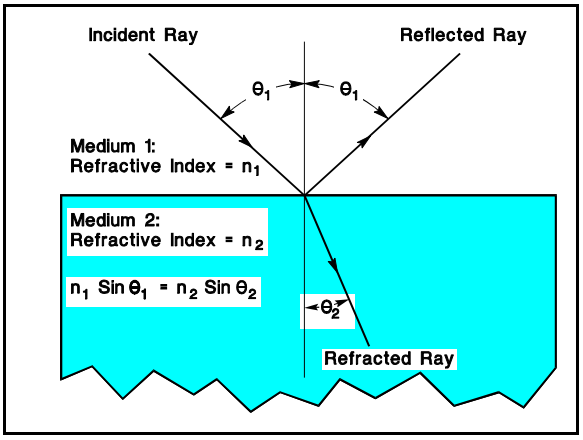
Snell's law: A law of geometric optics that defines the amount of bending that takes place when a light ray strikes a refractive boundary, *e.g.*, an air-glass interface, at a non-normal angle. *Note 1:* Snell's law states that

$$n_1 \sin\theta_1 = n_2 \sin\theta_2 \quad ,$$

where n_1 is the index of refraction of the medium in which the incident ray travels, θ_1 is the angle, with respect to the normal at the refractive boundary, at which the incident ray strikes the boundary, n_2 is the index of refraction of the medium in which the refracted ray travels, and θ_2 is the angle, with respect to the normal at the refractive boundary, at which the refracted ray travels. The incident ray and refracted ray travel in the same plane, on opposite sides of the normal at the point of incidence. *Note 2:* If a ray travels from a medium of lower refractive index into a medium of higher refractive index, it is bent toward the normal; if it travels from a medium of higher refractive index to a medium of lower index, it is bent away from the normal. *Note 3:* If the incident ray travels in a medium of higher refractive index toward a medium of lower refractive index at such an angle that Snell's law would call for the sine of the refracted ray to be greater than unity (a mathematical impossibility); *i.e.*,

$$\sin\theta_2 = \frac{n_1}{n_2} \sin\theta_1 > 1 \quad ,$$

then the "refracted" ray in actuality becomes a reflected ray and is totally reflected back into the medium of higher refractive index, at an angle equal to the incident angle (and thus still "obeys" Snell's Law). This reflection occurs even in the absence of a metallic reflective coating (*e.g.*, aluminum or silver). This phenomenon is called "*total internal reflection.*" The smallest angle of incidence, with respect to the normal at the refractive boundary, which angle will support total internal reflection, is called the "*critical angle.*" [After FAA]



Snell's law

SNMP: *Abbreviation for* **Simple Network Management Protocol.**

snow: In video display systems, noise that (a) is uniformly distributed on the display surface, such as that of a television or radar screen, (b) has the appearance of a uniform distribution of fixed or moving spots, mottling, or speckling, and (c) is usually caused by random noise on an intensity-modulated signal in a display device, such as a cathode-ray tube.

SNR: *Abbreviation for* **signal-to-noise ratio.**

soft copy: A nonpermanent display image, for example, a cathode ray tube display.

soft limiting: *See* **limiting.**

soft sectoring: On magnetic disks, magnetic drums, and optical disks, the identification of sector boundaries by using recorded information.

software: 1. A set of computer programs, procedures, and associated documentation concerned with the operation of a data processing system; *e.g.*, compilers, library routines, manuals, and circuit diagrams. [JP1] **2.** Information (generally copyrightable) that may provide instructions for computers; data for documentation; and voice, video, and music for entertainment or education.

software engineering: The discipline devoted to the design, development, and use of computer software. *Note:* Software engineering must address various aspects of data processing, including compatibility with the computer system which is to execute the software, and tradeoffs among maintainability, flexibility, efficiency, processing time, and costs. [From Weik '89]

software package: A package that consists of (a) one or more computer programs and possibly related material such as utility programs or tutorial programs, recorded on a medium suitable for delivery to the user, and from which the user can transfer the program(s) to a data-processing device, and (b) instructional materials such as handbooks and manuals, update information, and possibly support services information. *Note 1:* The computer programs may consist, for example, of application programs or operating systems, and are usually written in a high-level or low-level language, respectively. *Note 2:* The recording medium is usually a magnetic diskette or an optical compact disk.

software tool: Software, such as a computer program, routine, subroutine, program block, or program module, that can be used to develop, test, analyze, or maintain a computer program or its documentation. *Note:* Examples of software tools are automated software verification routines, compilers, program maintenance routines, bootstraps, program analyzers, and software monitors. [From Weik '89]

SOH: *Abbreviation for* **start-of-heading character.**

solid-state scanning: In facsimile, scanning in which all or a part of the scanning process is performed by electronic commutation of an array of solid-state photosensitive elements. (188)

soliton: An optical pulse having a shape, spectral content, and power level designed to take advantage of nonlinear effects in an optical fiber waveguide, for the purpose of essentially negating dispersion over long distances.

sonar: *Acronym for* **sound navigation and ranging.** A device that is used primarily for the detection and location of underwater objects by reflecting acoustic waves from them, or by the interception of acoustic waves from an underwater, surface, or above-surface acoustic source. *Note:* Sonar operates with acoustic waves in the same way that radar and radio direction-finding equipment operate with electromagnetic waves, including use of the Doppler effect, radial component of velocity measurement, and triangulation. [From Weik '89]

SONET: *Acronym for* **synchronous optical network.** An interface standard for synchronous 2.46-Gb/s optical-fiber transmission, applicable to the Physical Layer of the OSI Reference Model. *Note 1:* SONET uses a basic data rate of 51.840 Mb/s, called OC1 (optical carrier 1). The SONET hierarchy is defined in multiples of OC1, up to and including OC48, for a maximum data rate of 2.48832 Gb/s. *Note 2:* SONET was developed by the Exchange Carriers Standards Association (ECSA).

sonobuoy: In sonar systems, a device (a) that is used to detect acoustic waves, such as those produced by ships and submarines, (b) that, when activated, relays information by radio, (c) that may be active or passive, and (d) that may be directional or nondirectional. [From Weik '89]

sounder prediction station: A station equipped with an ionosphere sounder for realtime monitoring of upper atmosphere phenomena or to obtain data for the prediction of propagation conditions. [NTIA]

sounding: In automated HF radio systems, the broadcasting of a very brief signal, containing the station address, station identifier, or call sign, to permit receiving stations to measure link quality. (188)

sound navigation and ranging: *See* **sonar.**

sound-powered telephone: A telephone in which the operating power is derived from the speech input only. (188)

sound wave: *See* **acoustic wave.**

source: In communications, that part of a system from which messages are considered to originate. (188)

source efficiency: In optical systems, the ratio of emitted optical power of a source to the input electrical power. (188)

source language: In computing, data processing, and communications systems, a language from which statements are translated. *Note:* Translators, assemblers, and compilers prepare target language programs, usually machine-language programs, from source language programs, usually high-level language programs written by programmers.

source program: 1. A computer program written in a source language. *Note:* An example of a source program is a program that serves as the input to an assembler, compiler, or translator. **2.** A computer program that must be assembled, compiled, or translated before it can be executed by a computer. [From Weik '89]

source quench: A congestion-control technique in which a computer experiencing data traffic congestion sends a message back to the source of the messages or packets causing the congestion, requesting that the source stop transmitting.

source user: The user providing the information to be transferred to a destination user during a particular information transfer transaction. *Synonym* **information source.**

space: In telegraphy, one of the two significant conditions of encoding. (188) *Note 1:* The complementary significant condition is called a *"mark." Note 2:* In modern digital communications, the two corresponding significant conditions of encoding are called *"zero"* and *"one." Synonyms* **spacing pulse, spacing signal.**

spacecraft: A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere. [NTIA] [RR]

space diversity: A method of transmission or reception, or both, in which the effects of fading are minimized by the simultaneous use of two or more physically separated antennas, ideally separated by one or more wavelengths. (188)

space-division multiplexing: *A misnomer. Note: Space-division multiplexing* has been improperly applied to the use of multiple physical transmission channels, *e.g.*, twisted pairs or optical fibers, under one sheath.

space-division switching: In telephony, switching in which single transmission-path routing determination is accomplished in a switch by using a physically separated set of matrix contacts or cross-points. (188)

space operation service: A radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand. These functions will normally be provided within the service in which the space station is operating. [NTIA] [RR]

space radiocommunication: Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space. [NTIA] [RR]

space research service: A radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes. [NTIA] [RR]

space station: A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere. [NTIA] [RR]

space subsystem: In satellite communications, that portion of the satellite link that is in orbit. (188)

space system: Any group of cooperating Earth stations and/or space stations employing space radiocommunication for specific purposes. [NTIA] [RR]

space telecommand: The use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate functions of equipment on an associated space object, including the space station. [NTIA] [RR]

space telemetry: The use of telemetry for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of spacecraft. [NTIA] [RR]

space tracking: Determination of the orbit, velocity or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object. [NTIA] [RR]

spacing bias: The uniform lengthening of all spacing signal pulses at the expense of the pulse width of all marking signal pulses. (188)

spacing end distortion: *See* **end distortion.**

spacing pulse: *Synonym* **space.**

spacing signal: *Synonym* **space.**

spare: An individual part, subassembly, or assembly supplied for the maintenance or repair of systems or equipment.

spatial application: An application requiring high spatial resolution, possibly at the expense of reduced temporal positioning accuracy, *i.e.*, increased jerkiness. *Note:* Examples of spatial applications include the requirement to display small characters and to resolve fine detail in still video, or in motion video that contains very limited motion.

spatial coherence: *See* **coherent.**

spatial edge noise: In a video display, that form of edge busyness that is characterized by spatially varying distortion that occurs in close proximity to the edges of objects.

spatially coherent radiation: *See* **coherent.**

special grade access line: In the Defense Switched Network, an access line specially conditioned, usually by providing amplitude and delay equalization, to give it characteristics suitable for handling special services, such as reducing data signaling rates (DSR) to a rate between 600 b/s and 2400 b/s. (188)

special grade of service: In the Defense Switched Network, a network-provided service in which specially conditioned interswitch trunks and access lines are used to provide secure voice, data, and facsimile transmission. (188)

special interest group: *Synonym* **community of interest.**

specialized common carrier (SCC): A common carrier offering a limited type of service or serving a limited market.

special purpose computer: A computer that is designed to operate on a restricted class of problems.

special service: A radiocommunication service, not otherwise defined in this Section [of the *Radio Regulations*], carried on exclusively for specific needs of general utility, and not open to public correspondence. [RR with editor's note in brackets]

specification: 1. An essential technical requirement for items, materials, or services, including the procedures to be used to determine whether the requirement has been met. (188) *Note:* Specifications may also include requirements for preservation, packaging, packing, and marking. **2.** An official document intended primarily for supporting procurement, which document clearly and accurately describes the essential technical requirements for items, materials, or services, including the procedures by which it will be determined that the requirements have been met. (188) *Note:* An example of a Federal specification is FIPS-PUB 159, *Detail Specification for 62.5-µm Core Diameter/125-µm Cladding Diameter Class Ia Multimode Optical Fibers.*

specific detectivity: For a photodetector, a figure of merit used to characterize performance, equal to the reciprocal of noise equivalent power (*NEP*), normalized to unit area and unit bandwidth. *Note:* Specific detectivity, *D**, is given by

$$D^* = \frac{\sqrt{A\Delta f}}{NEP},$$

where A is the area of the photosensitive region of the detector and Δf is the effective noise bandwidth. *Synonym* **D-Star.**

speckle noise: *Synonym* **modal noise.**

speckle pattern: In optical systems, a field-intensity pattern produced by the mutual interference of partially coherent beams that are subject to minute temporal and spatial fluctuations. (188) *Note:* In a multimode fiber, a speckle pattern results from a superposition of mode field patterns. If the relative modal group velocities change with time, the speckle pattern will also change with time. If differential mode attenuation occurs, modal noise results.

spectral bandwidth: *See* **spectral width**.

spectral density: For a specified bandwidth of radiation consisting of a continuous frequency spectrum, the total power in the specified bandwidth divided by the specified bandwidth. *Note:* Spectral density is usually expressed in watts per hertz.

spectral irradiance: Irradiance per unit wavelength interval at a given wavelength, usually expressed in watts per unit area per unit wavelength interval. (188)

spectral line: A narrow range of emitted or absorbed wavelengths.

spectral loss curve: Of an optical fiber, a plot of attenuation as a function of wavelength. (188) *Note:* Spectral loss curves must be normalized with respect to distance before meaningful comparison among fibers can be made.

spectral purity: The degree to which a signal is monochromatic.

spectral radiance: Radiance per unit wavelength interval at a given wavelength, expressed in watts per steradian per unit area per wavelength interval. (188)

spectral responsivity: The ratio of an optical detector's electrical output to its optical input, as a function of optical wavelength.

spectral width: The wavelength interval over which the magnitude of all spectral components is equal to or greater than a specified fraction of the magnitude of the component having the maximum value. (188) *Note 1:* In optical communications applications, the usual method of specifying spectral width is the full width at half maximum. This method may be difficult to apply when the spectrum has a complex shape. Another method of specifying spectral width is a special case of root-mean-square deviation where the independent variable is wavelength, λ, and $f(\lambda)$ is a suitable radiometric quantity. *Note 2:* The *relative spectral width*, $\Delta\lambda/\lambda$, is frequently used where $\Delta\lambda$ is obtained according to note 1, and λ is the center wavelength.

spectral window: *See* **window.**

spectrum: *See* **electromagnetic spectrum, optical spectrum.**

spectrum designation of frequency: *See* **electromagnetic spectrum.**

spectrum signature: The pattern of radio signal frequencies, amplitudes, and phases, which pattern characterizes the output of a particular device and tends to distinguish it from other devices. (188)

specular reflection: Reflection from a smooth surface, such as a mirror, which maintains the integrity of the incident wavefront.

speech digit signaling: *Synonym* **bit robbing.**

speech-plus: Pertaining to a circuit that was designed and used for speech transmission, but to which other uses, such as digital data transmission, facsimile transmission, telegraph, or signaling superimposed on the speech signals, have been added by means of multiplexing. [From Weik '89]

speech-plus-duplex operation: Operation in which speech and telegraphy (duplex or simplex) are transmitted simultaneously over the same circuit, and mutual interference is eliminated by the use of filters. (188)

speech-plus-signaling: Pertaining to equipment that permits the use of part of a voice-frequency band for signaling. (188)

speech power: *See* **volume unit.**

speech synthesizer: A device that is capable of accepting digital or analog data and developing intelligible speech sounds that correspond to the input data, without resorting to recorded sounds or without simply being a speech scrambler operating in reverse. [From Weik '89]

speed calling: A service feature that enables a switch or station to store certain telephone numbers and dial them automatically when a short (1-, 2-, or 3-digit) code is entered. (188) *Contrast with* **repertory dialer, speed dialing.**

speed dialing: 1. *Synonym* **abbreviated dialing**. **2.** Dialing at a speed greater than the normal ten pulses per second. (188)

speed of light (*c*): The speed of an electromagnetic wave in free space, precisely 299,792,458 m/s. *Note 1:* The preceding figure is precise because by international agreement the meter is now defined in terms of the speed of light. *Note 2:* The speed of an electromagnetic wave, *e.g.*, light, is equal to the product of the wavelength and the frequency. *Note 3:* In any physical medium, the speed of light is lower than in free space. Since the frequency is not changed, the wavelength is also decreased. [After FAA]

speed of service: 1. The time between release of a message by the originator to receipt of the message by the addressee, as perceived by the end user. (188) *Synonym* **originator-to-recipient speed of service. 2.** The time between entry of a message into a communications system and receipt of the message at the terminating communications facility, *i.e.*, the communications facility serving the addressee, as measured by the system. (188)

speed-up tone: *Synonym* **camp-on busy signal.**

spike: An extremely short pulse of relatively high amplitude.

spike file: *See* **last-in first-out.**

spill forward: In automatic switching, the transfer of full control on a call to the succeeding office by sending forward the complete telephone address of the called party. (188)

spill-forward feature: A service feature, in the operation of an intermediate office, that, acting on incoming trunk service treatment indications, assumes routing control of the call from the originating office. (188) *Note:* This increases the chances of completion by offering the call to more trunk groups than are available in the originating office.

spillover: In an antenna, the part of the radiated energy from the feed that does not impinge on the reflectors.

spiral-four cable: A quadded cable with four conductors. (188) *Synonym* **star quadded cable.**

splice: 1. To join, permanently, physical media that conduct or transmit power or a communication signal. **2.** A device that so joins conducting or transmitting media. **3.** The completed joint.

splice closure: A usually weatherproof encasement, commonly made of tough plastic, that envelops the exposed area between spliced cables, *i.e.*, where the jackets have been removed to expose the individual transmission media, optical or metallic, to be joined. *Note 1:* The closure usually contains some device or means to maintain continuity of the tensile strength members of the cables involved, and also may maintain electrical continuity of metallic armor, and/or provide external connectivity to such armor for electrical grounding. *Note 2:* In the case of fiber optic cables, it also contains a splice organizer to facilitate the splicing process and protect the exposed fibers from mechanical damage. *Note 3:* In addition to the seals at its seams and points of cable entry, the splice closure may be filled with an encapsulant to further retard the entry of water. [After FAA] *Synonym* **closure**.

splice loss: In fiber optic systems, any loss of optical power at a splice. *Note:* A practical splice, of physically realizable fibers, has losses attributable to a number of mechanisms, some of which are intrinsic to the fibers, and some of which are intrinsic to the method or device being used to join them. [After FAA]

splice organizer: In optical communication, a device that facilitates the splicing or breaking out of fiber optic cables. *Note:* The organizer provides means to separate and secure individual buffer tubes, fibers, and/or pigtails. It also provides means to secure mechanical splices or protective sleeves used in connection with fusion splices, and has means to contain the slack fiber that remains after the splicing process is completed. [After FAA]

split homing: The connection of a terminal facility to more than one switching center by separate access lines, each of which has a separate directory number. (188)

split screen: On a display device, display space that has been divided into two or more areas, so that each area can display different portions of the same file or portions of different files. *Note 1:* The split screen excludes the data lying between the portions of the file or files being displayed and includes the desired data in the two or more windows afforded by the split screen. *Note 2:* Examples of split screens are screens in which different portions of a spreadsheet, database, graph, or picture that are too far apart in storage to be viewed or displayed simultaneously as a single image, are viewed adjacently on a single screen. [From Weik '89]

splitter: *See* **directional coupler**.

(*S*+*N*)/*N*: *Abbreviation for* **signal-plus-noise-to-noise ratio.**

spontaneous emission: Radiation emitted when the internal energy of a quantum mechanical system drops from an excited level to a lower level without regard to the simultaneous presence of similar radiation. *Note:* Examples of spontaneous emission include radiation from an LED, and radiation from an injection laser below the lasing threshold.

spoofing: 1. (COMSEC) [The] interception, alteration, and retransmission of a cipher signal or data in such a way as to mislead the recipient. [NIS] **2.** (AIS)

[An] attempt to gain access to an AIS by posing as an authorized user. [NIS]

spooling: The use of auxiliary storage as buffer storage to reduce processing delays when transferring data between peripheral equipment and the processors of a computer. *Note:* The term is derived from the expression *"simultaneous peripheral operation on line."*

sporadic E: Irregular scattered patches of relatively dense ionization that develop seasonally within the E region and that reflect and scatter frequencies up to 150 MHz. *Note 1:* The sporadic E is a regular day-time occurrence over the equatorial regions and is common in the temperate latitudes in late spring, early summer and, to a lesser degree, in early winter. *Note 2:* At high, *i.e.,* polar, latitudes, sporadic E can accompany auroras and associated disturbed magnetic conditions. *Note 3:* The sporadic E can sometimes support reflections for distances up to 2,400 km at frequencies up to 150 MHz. *Synonym* **sporadic E propagation.**

sporadic E propagation: *Synonym* **sporadic E.**

spot beam: In satellite communications systems, a narrow beam from a satellite station antenna that illuminates, with high irradiance, a limited area of the Earth by using beam (directive) antennas rather than Earth-coverage antennas.

spot jamming: The jamming of a specific channel or frequency. [JP1]

spot projection: In facsimile systems, optical scanning in which a scanning spot is moved across the object and the scanning spot size is determined by the illuminated area of the spot. (188)

spot size: 1. The size of the electron spot on the face of a cathode ray tube. *Note:* The spot size is larger than the diameter of the electron beam because of the spillover of electrons into adjacent areas of the screen near the spot. The spot size is a function of the ability of the tube to focus the electron beam, as well as of the electron gun aperture. [From Weik '89] **2.** In facsimile systems, the diameter of the scanning spot or the recording spot. [From Weik '89] **3.** In single-mode optical fibers, the effective core diameter.

spot speed: In facsimile systems, the speed of the scanning or recording spot along the available line. (188) *Note:* The spot speed is usually measured on the object or on the recorded copy.

spread spectrum: 1. Telecommunications techniques in which a signal is transmitted in a bandwidth considerably greater than the frequency content of the original information. (188) *Note:* Frequency hopping, direct sequence spreading, time scrambling, and combinations of these techniques are forms of spread spectrum. [NIS] **2.** A signal structuring technique that employs direct sequence, frequency hopping or a hybrid of these, which can be used for multiple access and/or multiple functions. This technique decreases the potential interference to other receivers while achieving privacy and increasing the immunity of spread spectrum receivers to noise and interference. Spread spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrowband information signal over a relatively wide band of frequencies. The receiver correlates the signals to retrieve the original information signal. [NTIA] (188)

spur: A secondary route having a junction to the primary route in a network.

spurious emission: Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions. [NTIA] [RR] (188)

spurious radiation: Any unintentional emission. (188)

spurious response: In radio reception, a response in the receiver intermediate frequency (IF) stage produced by an undesired emission in which the fundamental frequency (or harmonics above the fundamental frequency) of the undesired emission mixes with the fundamental or harmonic of the receiver local oscillator. (188)

square wave: A wave that has two significant conditions, *i.e.,* two levels of amplitude, that change from one condition to the other in a relatively short time compared to the wavelength. *Note:* When the

instantaneous amplitude is plotted versus time or distance, the waveform has a rectangular shape. [From Weik '89]

squelch: A circuit function that acts to suppress the audio output of a receiver. [NTIA] (188) *Note:* The squelch function is activated in the absence of a sufficiently strong desired input signal, in order to exclude undesired lower-power input signals that may be present at or near the frequency of the desired signal. *Contrast with* **noise suppression.**

sr: *Abbreviation for* **steradian.**

SSB: *Abbreviation for* **single sideband.** *See* **single-sideband emission.**

SSB-SC: *Abbreviation for* **single-sideband suppressed carrier.** *See* **single-sideband suppressed carrier transmission.**

SS7: *Abbreviation for* **Signaling System No. 7.**

stability: The invariability of a specified property of a substance, device, or apparatus with time, or under the influence of typically extrinsic factors.

stagger: In facsimile systems, periodic error in the position of the recorded spot along the recorded line. (188)

standard: 1. Guideline documentation that reflects agreements on products, practices, or operations by nationally or internationally recognized industrial, professional, trade associations or governmental bodies. *Note:* This concept applies to formal, approved standards, as contrasted to de facto standards and proprietary standards, which are exceptions to this concept. **2.** An exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results. A fixed quantity or quality. [JP1]

standard frequency and time signal-satellite service: A radiocommunication service using space stations on Earth satellites for the same purpose as those of the standard frequency and time signal service. This service may also include feeder links necessary for its operation. [NTIA] [RR]

standard frequency and time signal service: A radiocommunication service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception. [NTIA] [RR]

standard frequency and time signal station: A station in the standard frequency and time signal service. [NTIA] [RR]

Standard Generalized Mark-up Language: *See* **SGML.**

standardized profile: A profile that specifies one or more interoperable open systems interconnection stacks that are intended to cover one or more specific functional areas. (188) *Note:* Examples of standardized profiles are the ISO standardized profiles and the NATO standardized profiles.

standard optical source: A reference optical source to which emitting and detecting devices are compared for calibration purposes. (188) *Note:* In the United States, recognized standard optical sources must be traceable to the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS).

standard telegraph level (*STL*): The power per individual telegraph channel required to yield the standard composite data level. *Note:* For example, for a composite data level of –13 dBm at 0-dBm transmission level point (0TLP), the *STL* would be approximately –25 dBm for a 16-channel VFCT terminal computed from $STL = -(13+10\log_{10} n)$, where n is the number of telegraph channels and the *STL* is in dBm. (188)

standard test signal: A single-frequency signal with standardized level used for testing the peak power transmission capability and for measuring the total harmonic distortion of circuits or parts of a circuit. (188) *Note:* Standardized test signal levels and frequencies are listed in MIL-STD-188-100 and in the *Code of Federal Regulations*, Title 47, part 68.

standard test tone: A single-frequency signal with a standardized level generally used for level alignment of single links and of links in tandem. (188) *Note:* For standardized test signal levels and frequencies, see MIL-STD-188-100 for DOD use, and the *Code of Federal Regulations*, Title 47, part 68 for other Government agencies.

standard time and frequency signal (STFS) service: In the United States, standard time and frequency signals, broadcast on very precise carrier frequencies by the U.S. Naval Observatory and the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS). *Note:* The *Radio Regulations* (RR) define an identical international service as **standard frequency and time signal service**.

standby: 1. In computer and communications systems operations, pertaining to a power-saving condition or status of operation of equipment that is ready for use but not in use. *Note:* An example of a standby condition is a radio station operating condition in which the operator can receive but is not transmitting. **2.** Pertaining to a dormant operating condition or state of a system or equipment that permits complete resumption of operation in a stable state within a short time. **3.** Pertaining to spare equipment that is placed in operation only when other, in-use equipment becomes inoperative. *Note:* Standby equipment is usually classified as (a) *hot* standby equipment, which is warmed up, *i.e.*, powered and ready for immediate service, and which may be switched into service automatically upon detection of a failure in the regular equipment, or (b) *cold* standby equipment, which is turned off or not connected to a primary power source, and which must be placed into service manually.

standing wave: In a transmission line, a wave in which the distribution of current, voltage, or field strength is formed by the superposition of two waves propagating in opposite directions, and which wave is characterized by a series of nodes (maxima) and anti-nodes (minima) at fixed points along the transmission line. *Note:* A standing wave may be formed when a wave is transmitted into one end of a transmission line and is reflected from the other end by an impedance mismatch, *i.e.*, discontinuity, such as an open or a short. *Synonym* **stationary wave.**

standing wave ratio (*SWR*): The ratio of the amplitude of a standing wave at an anti-node (minimum) to the amplitude at an adjacent node (maximum). (188) *Note 1:* The standing wave ratio (*SWR*) in a uniform transmission line is given by

$$SWR = \frac{1 + \rho}{1 - \rho} ,$$

where ρ is the reflection coefficient. *Note 2:* Reflections occur as a result of discontinuities, such as an imperfection in an otherwise uniform transmission line, or when a transmission line is terminated with other than its characteristic impedance.

star coupler: A passive optical coupler having a number of input and output ports, used in network applications. *Note:* An optical signal introduced into any input port is distributed to all output ports. Because of the nature of the construction of a passive star coupler, the number of ports is usually a power of 2; *i.e.*, two input ports and two output ports (a "two-port" coupler, customarily called a *"directional coupler,"* or *"splitter"*); four input ports and four output ports (a "four-port" coupler); eight input ports and eight output ports (an "eight-port" coupler); *etc.* [FAA]

star network: *See* **network topology.**

star quadded cable: *Synonym* **spiral-four cable.**

starting frame delimiter: A specified bit pattern that indicates the start of a transmission frame.

start message: *Synonym* **go-ahead notice.**

start notice: *Synonym* **go-ahead notice.**

start-of-heading character (SOH): A transmission control character used as the first character of a message heading.

start-of-text character (STX): A transmission control character that precedes a text and may be used to terminate the message heading.

star topology: *See* **network topology.**

start pulse: *See* **A-condition, start signal.**

start-record signal: In facsimile systems, a signal used for starting the process of converting the electrical signal to an image on the record medium. (188)

start signal: **1.** A signal that prepares a device to receive data or to perform a function. *Contrast with* **A-condition.** **2.** In start-stop transmission, a signal at the beginning of a character that prepares the receiving device for the reception of the code elements. *Note:* A start signal is limited to one signal element usually having the duration of a unit interval. (188)

start-stop character: A character that includes one start signal at the beginning and one or two stop signals at the end.

start-stop distortion: In start-stop modulation, the ratio of (a) the maximum absolute difference between the actual and the theoretical intervals that separate any significant instant of modulation or demodulation from the significant instant of the start signal element immediately preceding it to (b) the unit interval. (188)

start-stop margin: In start-stop modulation, the maximum amount of overall start-stop distortion that is compatible with correct translation by the start-stop equipment of all the character signals that appear singly, that appear at the maximum allowable speed, or that appear at the standard modulation rate. (188)

start-stop modulation: A method of modulation in which the time of occurrence of the bits within each character, or block of characters, relates to a fixed time frame, but the start of each character, or block of characters, is not related to this fixed time frame. (188)

start-stop system: *Synonym* **asynchronous communications system.**

start-stop transmission: **1.** Asynchronous transmission in which a start pulse and a stop pulse are used for each symbol. (188) **2.** Signaling in which each group of code elements corresponding to an alphanumeric character is (a) preceded by a start signal that serves to prepare the receiving mechanism for the reception and registration of a character and (b) followed by a stop signal that serves to bring the receiving mechanism to rest in preparation for the reception of the next character. (188)

start-stop TTY distortion: *Synonym* **teletypewriter signal distortion.**

statement: **1.** In programming languages, a language construct that represents a set of declarations or a step in a sequence of actions. **2.** In computer programming, a symbol string or other arrangement of symbols. **3.** In computer programming, a meaningful expression or generalized instruction, represented in a source language.

staticizer: *See* **serial-to-parallel conversion.**

station: One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service. Each station shall be classified by the service in which it operates permanently or temporarily. [NTIA] [RR]

stationary satellite: *See* **geostationary orbit.**

stationary wave: *Synonym* **standing wave.**

station battery: Within a facility, a separate battery power source that satisfies all significant requirements for dc input power associated with the facility. (188) *Note:* Station batteries are usually centrally located. The batteries may power radio and telephone equipment as well as provide emergency lighting and controls for the equipment.

station clock: In a station, the principal clock, or alternate clock, that provides the timing reference at the station. (188)

station equipment: *See* **customer premises equipment.**

station load: The total power requirements of the integrated station facilities. (188)

station message-detail recording (SMDR): A record of all calls originated or received by a switching system. *Note:* SMDRs are usually generated by a computer.

statistical multiplexing: Multiplexing in which channels are established on a statistical basis; *i.e.*, connections are made according to probability of need.

statistical time-division multiplexing: Time-division multiplexing in which connections to communication circuits are made on a statistical basis.

statute mile: A unit of distance equal to 1.609 km (0.869 nmi, 5280 ft.). (188)

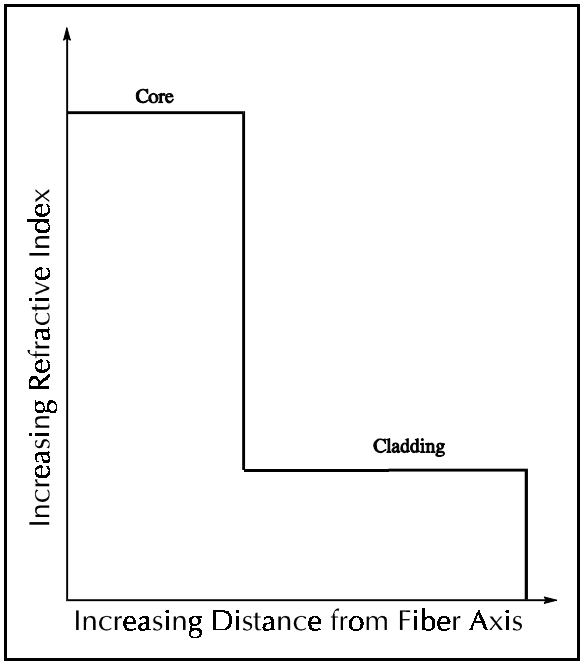
STDM: *Abbreviation for* **statistical time-division multiplexing.**

steady-state condition: **1.** In a communications circuit, a condition in which some specified characteristic of a condition, such as a value, rate, periodicity, or amplitude, exhibits only negligible change over an arbitrarily long period. **2.** In an electrical circuit, the condition that exists after all initial transients or fluctuating conditions have damped out, and all currents, voltages, or fields remain essentially constant, or oscillate uniformly. (188) **3.** In fiber optics, *synonym for* **equilibrium mode distribution.**

step-by-step (SXS) switching system: An automatic dial telephone system in which calls are switched by a succession of switches that move a step at a time, from stage to stage, each step being made in response to the dialing of a number. (188)

step-index fiber: An optical fiber with a core having a uniform refractive index. (188)

step-index profile: For an optical fiber, a refractive index profile characterized by a uniform refractive index within the core and a sharp decrease in refractive index at the core-cladding interface. (188) *Note 1:* The step-index profile corresponds to a power-law index profile with the profile parameter approaching infinity. *Note 2:* The step-index profile is used in most single-mode fibers and some multimode fibers.



step-index profile

steradian (sr): The metric unit of solid angle. *See* **metric system.**

stereophonic crosstalk: An undesired signal occurring in the main channel from modulation of the stereophonic channel or that occurring in the stereophonic channel from modulation of the main channel. [47CFR]

stereophonic sound subcarrier: A subcarrier within the FM broadcast baseband used for transmitting signals for stereophonic sound reception of the main broadcast program service. [47CFR]

STFS: *Abbreviation for* **standard time and frequency signal.** *See* **standard time and frequency signal service.**

still image: Nonmoving visual information, *i.e.*, fixed images, such as graphs, drawings, and pictures. (188)

still video: Video imagery that is not intended to convey the appearance of movement. *Contrast with* **freeze frame, freeze frame television.**

stimulated emission: In a quantum mechanical system, the radiation emitted when the internal energy of the system drops from an excited level (induced by the presence of radiant energy at the same frequency) to a lower level. *Note:* An example of stimulated emission is the radiation from an injection laser diode operated above the lasing threshold.

STL: *Abbreviation for* **standard telegraph level, studio-to-transmitter link.**

stopband: A band of frequencies, between specified limits, that a circuit, such as a filter or telephone circuit, does not transmit. (188) *Note 1:* Frequencies above the lower limit and below the upper limit are not transmitted, *i.e.*, are not allowed to pass. *Note 2:* The limiting frequencies are those at which the transmitted power level increases to a specified level, usually 3 dB below the maximum level, as the frequency is decreased or increased from that at which the transmitted power is a minimum. *Note 3:* The difference between the limits is the stopband bandwidth, usually expressed in hertz.

stop element: *See* **stop signal.**

stop-record signal: In facsimile systems, a signal used for stopping the process of converting the electrical signal to an image on the record medium. (188)

stop signal: 1. In start-stop transmission, a signal at the end of a character that prepares the receiving device for the reception of a subsequent character. A stop signal is usually limited to one signal element having any duration equal to or greater than a specified minimum value. (188) **2.** A signal to a receiving mechanism to wait for the next signal.

storage: 1. The retention of data in any form, usually for the purpose of orderly retrieval and documentation. [JP1] **2.** A device consisting of electronic, electrostatic, electrical, hardware or other elements into which data may be entered, and from which data may be obtained, as desired. [JP1]

storage cell: 1. An addressable storage unit. **2.** The smallest subdivision of storage into which a unit of data can be entered, stored, and retrieved. *Synonym* **storage element.**

storage element: *Synonym* **storage cell.**

storage register: *See* **register.**

store-and-forward (S-F): Pertaining to communications systems in which messages are received at intermediate routing points and recorded *i.e.,* stored, and then transmitted, *i.e.,* forwarded, to the next routing point or to the ultimate recipient. (188)

store-and-forward switching center: A message switching center in which a message is accepted from the originating user, *i.e.*, sender, when it is offered, held in a physical storage, and forwarded to the destination user, *i.e.*, receiver, in accordance with the priority placed upon the message by the originating user and the availability of an outgoing channel. (188)

stored-program computer: A computer that (a) is controlled by internally stored instructions, (b) can synthesize and store instructions, and (c) can subsequently execute those instructions.

STP: *Abbreviation for* **signal transfer point.**

strap: *See* **cross-connection.**

stray current: Electrical current through a path other than the intended path. (188)

streamer: *Synonym* **streaming tape drive.**

streaming tape drive: A magnetic tape unit capable of recording from, and dumping to, another storage medium without stopping at interblock gaps. *Note:* Streaming tape drives are often used for bulk transfer of data between tape and disk storage. *Synonym* **streamer.**

streaming tape recording: A method of recording on magnetic tape, which method maintains continuous tape motion without the requirement to start and stop within the interrecord gap.

strength member: Any component of a communication cable, metallic or optical, the function of which is to protect the transport medium, *i.e.*, conductor or fiber, from excessive tensile and bending stresses during installation and while in service. [After FAA]

stressed environment: In radiocommunications, an environment that is under the influence of extrinsic factors that degrade communications integrity, such as when (a) the benign communications medium is disturbed by natural or man-made events (such as an intentional nuclear burst), (b) the received signal is degraded by natural or man-made interference (such as jamming signals or co-channel interference), (c) an interfering signal can reconfigure the network, and/or (d) an adversary threatens successful communications, in which case radio signals may be encrypted in order to deny the adversary an intelligible message, traffic flow information, network information, or automatic link establishment (ALE) control information.

string: A sequence of data elements, such as bits or characters, considered as a whole.

stroke: A straight line or arc that is used as a segment of a graphic character.

stroke edge: In character recognition, the line of discontinuity between a side of a stroke and the background, obtained by averaging, over the length of the stroke, the irregularities resulting from the printing and detecting processes.

stroke speed: In facsimile systems, the rate at which a fixed line perpendicular to the direction of scanning is crossed in one direction by a scanning or recording spot. (188) *Note 1:* Stroke speed is usually expressed as a number of strokes per minute. When the system scans in both directions, the stroke speed is twice this number. *Note 2:* In most conventional mechanical systems, the stroke speed is equivalent to drum speed.

stroke width: In character recognition, the distance between the two edges of a stroke, measured perpendicular to the stroke centerline.

structured programming: A technique for organizing and coding computer programs in which a hierarchy of modules is used, each having a single entry and a single exit point, and in which control is passed downward through the structure without unconditional branches to higher levels of the structure. Three types of control flow are used: sequential, test, and iteration.

STU: *Acronym for* **secure telephone unit**. A U.S. Government-approved telecommunications terminal that protects the transmission of sensitive or classified information in voice, data, and facsimile systems.

studio-to-transmitter link (STL): A communications link used for the transmission of broadcast material from a studio to the transmitter. *Note:* The STL may be a microwave, radio, or landline link.

stuffing: *See* **bit stuffing, de-stuffing.**

stunt box: A device that controls the nonprinting functions of a printer at a terminal.

STX: *Abbreviation for* **start-of-text character.**

SUB: *Acronym for* **substitute character.**

sub-band adaptive differential pulse code modulation (SB-ADPCM): Modulation in which (a) an audio frequency band is split into two sub-bands, *i.e.*, a higher and a lower band, and (b) the signals in each sub-band are encoded using ADPCM. (188)

subcarrier: A carrier used to modulate another carrier. *Note:* The modulated carrier can be used to modulate another carrier, and so on, so that there can be several levels of subcarriers, *i.e.*, several intermediate carriers. (188)

sublayer: **1.** In a layered open communications system, a specified subset of the services, functions, and protocols included in a given layer. **2.** In the Open Systems Interconnection—Reference Model, a subdivision of a given layer, *e.g.*, a conceptually complete group of the services, functions, and protocols included in the given layer.

subnet address: In an Internet Protocol (IP) address, an extension that allows users in a network to use a single IP network address for multiple physical subnetworks. *Note:* The IP address contains three parts: the network, the subnet, and host addresses. Inside the subnetwork, gateways and hosts divide the local portion of the IP address into a subnet address and a host address. Outside of the subnetwork, routing continues as usual by dividing the destination address into a network portion and a local portion.

subnetwork: A collection of equipment and physical transmission media that forms an autonomous whole

and that can be used to interconnect systems for purposes of communication.

subordinate station: *Synonym* **slave station.**

subroutine: A set of computer instructions to carry out a predefined function or computation. *Note: "Open"* subroutines are integrated into the main program. *"Closed"* subroutines are arranged so that program control is shifted to them for execution of their task(s) and then returned to the main program.

subscriber: In a public switched telecommunications network, the ultimate user, *i.e.*, customer, of a communications service. *Note 1:* Subscribers include individuals, activities, organizations, etc. *Note 2:* Subscribers use end instruments, such as telephones, modems, facsimile machines, computers, and remote terminals, that are connected to a central office. *Note 3:* Subscribers are usually subject to tariff. *Note 4:* Subscribers do not include communications systems operating personnel except for their personal terminals.

subscriber line: *Synonym* **loop (def. #1).**

substitute character (SUB): A control character that is used in the place of a character that is recognized to be invalid or in error or that cannot be represented on a given device.

substitution method: In optical fiber technology, a method of measuring the transmission loss by (a) using a stable optical source, at the wavelength of interest, to drive a mode scrambler, the output of which overfills (drives) a 1-meter to 2-meter reference fiber having physical and optical characteristics matching those of the fiber under test, (b) measuring the power level at the output of the reference fiber, (c) repeating the procedure, substituting the fiber under test for the reference fiber, and (d) subtracting the power level obtained at the output of the fiber under test from the power level obtained at the output of the reference fiber, to get the transmission loss of the fiber under test. *Note 1:* The substitution method has certain shortcomings with regard to its accuracy, but its simplicity makes it a popular field test method. It is conservative, in that if it were used to measure the individual losses of several long fibers, and the long fibers were concatenated, the total loss obtained (excluding splice losses) would be expected to be lower than the sum of the individual fiber losses. *Note 2:* Some modern optical power meters have the capability to set to zero the reference level measured at the output of the reference fiber, so that the transmission loss of the fiber under test may be read out directly.

subvoice-grade channel: A channel with a bandwidth narrower than that of a voice-grade channel. *Note:* A subvoice-grade channel is usually a subchannel of a voice-grade line.

successful block delivery: The transfer of a nonduplicate user information block between the source user and intended destination user. *Note:* Successful block delivery includes the delivery of correct and incorrect blocks. *Contrast with* **successful block transfer.**

successful block transfer: The transfer of a correct, nonduplicate, user information block between the source user and intended destination user. *Note:* Successful block transfer occurs when the last bit of the transferred block crosses the functional interface between the telecommunications system and the intended destination user. Successful block transfer can only occur within a defined maximum block transfer time after initiation of a block transfer attempt. *Contrast with* **successful block delivery.**

successful disengagement: The termination of user information transfer between a source user and a destination user in response to a disengagement request. *Note:* Successful disengagement occurs at the earliest moment at which either user is able to initiate a new information transfer transaction.

sudden ionospheric disturbance (SID): An abnormally high ionization density in the D region caused by an occasional sudden solar flare, *i.e.*, outburst of ultraviolet light from the Sun. *Note:* The SID results in a sudden increase in radio-wave absorption that is most severe in the upper medium-frequency (MF) and lower high-frequency (HF) ranges. (188)

sum check: *Synonym* **summation check.**

summation check: 1. A check based on the formation of the sum of the digits of a numeral. *Note:* The sum of the individual digits is usually compared with a

previously computed value. **2.** A comparison of checksums on the same data on different occasions or on different representations of the data in order to verify data integrity. *Synonym* **sum check.**

sunspot: In the photosphere, *i.e.*, visible disk of the Sun, a dark marking that manifests a magnetic anomaly that is associated with interference with radio communications on Earth. *Note:* Sunspot activity, *i.e.*, the number of sunspots occurring at a given time or on a given day, is cyclic. The period of a cycle, from maximum through minimum and back to maximum sunspot count, is approximately 11 years.

superencryption: [The] process of encrypting encrypted information. *Note:* [This process] occurs when a message, encrypted off-line, is transmitted over a secured, on-line circuit, or when information encrypted by the originator is multiplexed into a communications trunk, which is then bulk encrypted. [NIS]

supergroup: *See* **group, multiplex hierarchy.**

supergroup distribution frame (SGDF): In frequency-division multiplexing (FDM), the distribution frame that provides terminating and interconnecting facilities for group modulator output, group demodulator input, supergroup modulator input, and supergroup demodulator output circuits of the basic supergroup spectrum of 312 kHz to 552 kHz. (188)

super high frequency (SHF): *See* **electromagnetic spectrum.**

superluminescent LED: A light-emitting diode in which there is stimulated emission with amplification but insufficient feedback for oscillations to build up to achieve lasing action.

superradiance: In a gain medium, amplification of spontaneously emitted radiation characterized by moderate spectral line narrowing and moderate directionality. *Note:* Superradiance is usually distinguished from lasing action by the absence of positive feedback, and hence the absence of well-defined modes of oscillation.

supervisor: *Synonym* **supervisory program.**

supervisory control: The use of characters or signals for the automatic actuation of equipment or indicators.

supervisory program: 1. A program, usually part of an operating system, that controls the execution of other routines and regulates work scheduling, input-output operations, error actions, and similar functions. (188) **2.** A program that allocates computer component space and schedules computer events by task queuing and system interrupts. *Note:* Control of the system is returned to the supervisory program frequently enough to ensure that demands on the system are met. *Synonym* **supervisory routine. 3.** A computer program, usually part of an operating system, that controls the execution of other computer programs and regulates the flow of work in a data processing system. *Synonyms* **executive program, supervisor.**

supervisory routine: *Synonym* **supervisory program.**

supervisory signals: Signals used to indicate, or to indicate and control, the various operating states of the circuits or circuit combinations involved in a particular connection. (188)

suppressed carrier single-sideband emission: A single-sideband emission in which the carrier is virtually suppressed and not intended to be used for demodulation. [NTIA] [RR]

suppressed carrier transmission: Amplitude modulation (AM) transmission in which the carrier level is reduced below that required for demodulation. *Note 1:* Reduction of the carrier level permits higher power levels in the sidebands than would be possible with conventional AM transmission. *Note 2:* Carrier power must be restored by the receiving station to permit demodulation. *Note 3:* Suppressed carrier transmission is a special case of reduced carrier transmission.

surface refractivity: The refractive index of the Earth's atmosphere, calculated from observations of pressure, temperature, and humidity at the surface of the Earth. (188) *Note:* The surface refractivity gradient is the difference in refractive index between

the surface and a given altitude, such as between the surface and 1000 m.

surface wave: A wave that is guided along the interface between two different media or by a refractive index gradient. (188) *Note 1:* The field components of the wave diminish with distance from the interface. *Note 2:* Optical energy is not converted from the surface wave field to another form of energy and the wave does not have a component directed normal to the interface surface. *Note 3:* In optical fiber transmission, evanescent waves are surface waves. *Note 4:* In radio transmission, ground waves are surface waves that propagate close to the surface of the Earth, the Earth having one refractive index and the atmosphere another, thus constituting an interface surface.

surge: *Synonym* **impulse.**

surge suppressor: *Synonym* **arrester.**

survey: *See* **path survey.**

survivability: A property of a system, subsystem, equipment, process, or procedure that provides a defined degree of assurance that the named entity will continue to function during and after a natural or man-made disturbance; *e.g.,* nuclear burst. (188) *Note:* For a given application, survivability must be qualified by specifying the range of conditions over which the entity will survive, the minimum acceptable level or post-disturbance functionality, and the maximum acceptable outage duration.

survivable operation: *See* **survivability.**

survival craft station: A mobile station in the maritime mobile service or the aeronautical mobile service intended solely for survival purposes and located on any lifeboat, life-raft or other survival equipment. [NTIA] [RR]

susceptibility: In electronic warfare, the degree to which electronic equipment is affected by electromagnetic energy radiated by an enemy's equipment, such as jamming transmitters. (188)

susceptibility threshold: The amount of undesired signal power required at the input terminals of a receiver to cause barely perceptible interference at the receiver output terminals.

susceptiveness: In telephone systems, the extent to which circuits pick up noise and low-frequency energy by induction from power systems. *Note:* Susceptiveness depends on telephone circuit balance, wire and connection transpositions, wire spacing, and isolation from ground. (188)

sweep acquisition: A technique whereby the frequency of the local oscillator is slowly swept past the reference in order to assure that the pull-in range is reached.

sweep jamming: Jamming in which (a) a narrow frequency band of jamming energy is repeatedly swept over a relatively wide frequency band, (b) the sweep rate is such as to be on any given frequency only long enough to accomplish its jamming task, returning to that frequency again before the expiration of the jammed circuit recovery time. *Note 1:* Sweep jamming combines the advantages of both spot- and barrage-jamming by rapid electronic sweeping of a narrow band of jamming signals over a broad frequency spectrum. *Note 2:* The disadvantage of sweep-jamming is its high susceptibility to electronic counter-countermeasures. [From Weik '89]

swim: Slow, graceful, undesired movements of display elements, groups, or images about their mean position on a display surface, such as that of a monitor. *Note 1:* Swim can be followed by the human eye, whereas jitter usually appears as a blur. *Note 2:* Jitter, swim, wander, and drift have increasing periods of variation in that order.

switch: 1. In communications systems, a mechanical, electro-mechanical, or electronic device for making, breaking, or changing the connections in or among circuits. (188) **2.** *Deprecated synonym for* **central office, switching center. 3.** In communications systems, to transfer a connection from one circuit to another. **4.** In a computer program, a conditional instruction and a flag that is interrogated by the instruction. **5.** In a computer program, a parameter that controls branching and that is bound, prior to the branch point being reached. *Synonym* **switchpoint. 6.** In computer programming, a programming technique or statement for making a selection, such as

a conditional jump. **7.** In computer software applications, a functional unit, such as a toggle button, used to make selections.

switchboard: Equipment used for manual switching operations. (188)

switch busy hour: In telephony, the busy hour for a single switch. (188)

switched circuit: In a communications network, a circuit that may be temporarily established at the request of one or more of the connected stations. (188)

switched loop: In telephony, a circuit that automatically releases a connection from a console or switchboard, once the connection has been made to the appropriate terminal. *Note:* Loop buttons or jacks are used to answer incoming listed directory number calls, dial "0" internal calls, transfer requests, and intercepted calls. The attendant can handle only one call at a time. *Synonym* **released loop.**

switched multimegabit data services (SMDS): A connectionless, broadband, packet-switched data service that provides LAN-like performance and features in metropolitan or wide areas. *Note:* Currently SMDS operates at 1.544 Mb/s (megabits per second) or 44.736 Mb/s. These are the T1 and T3 rates, respectively, over switched fiber optic networks.

switched network: 1. A communications network, such as the public switched telephone network, in which any user may be connected to any other user through the use of message, circuit, or packet switching and control devices. **2.** Any network providing switched communications service. (188)

switching: The controlling or routing of signals in circuits to execute logical or arithmetic operations or to transmit data between specific points in a network. *Note:* Switching may be performed by electronic, optical, or electromechanical devices. [From Weik '89]

switching center: In communications systems, a facility in which switches are used to interconnect communications circuits on a circuit-, message-, or packet-switching basis. (188) *Synonyms, in telephony,* **central office, switching exchange, switching facility.** *Deprecated synonym* **switch.**

switching exchange: *Synonym* **switching center.**

switching facility: *Synonym* **switching center.**

switching system: 1. A communications system consisting of switching centers and their interconnecting media. (188) **2.** Part of a communication system organized to temporarily associate functional units, transmission channels or telecommunication circuits for the purpose of providing a desired telecommunication facility. *Note:* Examples of NATO-owned switching system are IVSN and TARE. [NATO]

switchpoint: *Synonym* **switch (def. #5).**

SWR: *Abbreviation for* **standing wave ratio.**

SX: *Abbreviation for* **simplex signaling.**

SXS: *Abbreviation for* **step-by-step switching system.**

syllable: A character string or a bit string in a word.

symbolic language: A computer programming language used to express addresses and instructions with symbols convenient to humans rather than to machines.

symbolic logic: The discipline in which valid arguments and operations are dealt with using an artificial language designed to avoid the ambiguities and logical inadequacies of natural languages.

symmetrical channel: A channel in which the send and receive circuits have the same data signaling rate.

symmetrical pair: A balanced transmission line, in a multipair cable, having equal conductor resistances per unit length, equal impedances from each conductor to earth, and equal impedances to other lines. (188)

SYN: *Acronym for* **synchronous idle character.**

sync pulse: *Synonym* **synchronization pulse.**

synchronism: 1. The state of being synchronous. **2.** For repetitive events with the same, multiple, or submultiple repetition rates, a relationship among the events such that a significant instant of one event bears a fixed time relationship to a corresponding instant in another event. *Note:* Synchronism is maintained when there is a fixed, *i.e.*, constant, phase relationship among the group of repetitive events. **3.** The simultaneous occurrence of two or more events at the same instant on the same coordinated time scale. (188)

synchronization: 1. The attaining of synchronism. **2.** The obtaining of a desired fixed relationship among corresponding significant instants of two or more signals. (188) **3.** A state of simultaneous occurrences of significant instants among two or more signals.

synchronization bit: A bit used to achieve or maintain synchronism. (188) *Note:* The term *"synchronization bit"* is usually applied to digital data streams, whereas the term *"synchronization pulse"* is usually applied to analog signals.

synchronization code: In digital systems, a sequence of bits introduced into a transmitted signal to achieve or maintain synchronism.

synchronization pulse: A pulse used to achieve or maintain synchronism. *Note:* The term *"synchronization pulse"* is usually applied to analog signals, whereas the term *"synchronization bit"* is usually applied to digital data streams. *Synonym* **sync pulse.**

synchronizing: 1. Achieving and maintaining synchronism. **2.** In facsimile, achieving and maintaining predetermined speed relations between the scanning spot and the recording spot within each scanning line. (188) *Note:* In the civilian community, the noun "*synchronization*" is preferred to "*synchronizing*."

synchronizing pilot: In FDM, a reference frequency used for achieving and maintaining syntonization of the oscillators of a carrier system or for comparing the frequencies or phases of the signals generated by those oscillators. (188)

synchronizing signal: In facsimile systems, the signal that maintains predetermined speed relations between the scanning spot and recording spot within each facsimile scanning line. (188)

synchronous: 1. Pertaining to the relationship of two or more repetitive signals that have simultaneous occurrences of significant instants. (188) *Note:* "*Isochronous*" and "*anisochronous*" pertain to characteristics. "*Synchronous*" and "*asynchronous*" pertain to relationships. **2.** Pertaining to synchronism (def.#2).

synchronous crypto-operation: [A] method of on-line crypto-operation in which crypto-equipment and associated terminals have timing systems to keep them in step. [NIS]

synchronous data link control (SDLC): In a data network, a bit-oriented protocol for the control of synchronous transmission over data links.

synchronous data network: A data network in which synchronism is achieved and maintained between data circuit-terminating equipment (DCE) and the data switching exchange (DSE), and between DSEs. (188) *Note:* The data signaling rates are controlled by timing equipment within the network.

synchronous height: *See* **synchronous orbit.**

synchronous idle character (SYN): A transmission control character used in synchronous transmission systems to provide a signal from which synchronism or synchronous correction may be achieved between data terminal equipment, particularly when no other character is being transmitted.

synchronous network: A network in which clocks are controlled to run, ideally, at identical rates, or at the same mean rate with a fixed relative phase displacement, within a specified limited range. (188) *Note:* Ideally, the clocks are synchronous, but they may be mesochronous in practice. By common usage, such mesochronous networks are frequently described as *"synchronous."*

synchronous optical network: *See* **SONET**.

synchronous orbit: Any orbit in which an orbiting object has a period equal to the average rotational period of the body being orbited, and in the same direction of rotation as that body. *Note 1:* A

synchronous orbit need not be equatorial, but it usually is, ideally. A body in a nonequatorial synchronous orbit will, when observed from a fixed point on the orbited body, appear to move up and down, *i.e.*, northward and southward. If the synchronous orbit is not perfectly circular, the orbiting body will appear to move back and forth, eastward and westward. The combination of these two motions will produce a figure-8 pattern as seen from the orbited body. *Note 2:* A synchronous orbit about the Earth that is circular and lies in the equatorial plane is called a geostationary orbit.

synchronous satellite: A satellite in a synchronous orbit. (188)

synchronous system: A system in which events, such as signals, occur in synchronism. *Note:* An example of a synchronous system is one in which a transmitter and receiver operate with a fixed time relationship. (188)

synchronous TDM: A multiplexing scheme in which timing is obtained from a clock that controls both the multiplexer and the channel source. (188)

synchronous transfer mode: In a Broadband Integrated Services Digital Network (B-ISDN), a proposed transport level technique in which time-division multiplexing and switching is to be used across the user's network interface.

synchronous transmission: Digital transmission in which the time interval between any two similar significant instants in the overall bit stream is always an integral number of unit intervals. (188) *Note:* "*Isochronous"* and "*anisochronous"* are characteristics, while "*synchronous"* and *"asynchronous"* pertain to relationships.

syntax: 1. In a language, the relationships among characters or groups of characters, independent of their meanings or the manner of their interpretation and use. **2.** The structure of expressions in a language. **3.** The rules governing the structure of a language. **4.** In a language, the relationship among symbols. *Note:* In computer languages, as in all artificial languages, syntax is developed, and usually described, before their use begins. In natural languages, syntax is developed, and sometimes never described, after use has begun.

syntonization: The process of setting the frequency of one oscillator equal to that of another.

SYSGEN: *Acronym for* **system generation.**

system: 1. Any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. [JP1] **2.** A collection of personnel, equipment, and methods organized to accomplish a set of specific functions. (188)

system administration: In computer technology, a set of functions that provides support services, ensures reliable operations, promotes efficient use of the system, and ensures that prescribed service-quality objectives are met. *Synonym* **system management.**

system analysis: A systematic investigation of a real or planned system to determine the functions of the system and how they relate to each other and to any other system. *Synonym* **systems analysis.**

system blocking: *Synonym* **access denial.**

system blocking signal: A control message generated within a telecommunications system to indicate temporary unavailability of system resources required to complete a requested access. *Note:* The system blocking signal is part of system overhead information.

system budget: *See* **power budget.**

system documentation: The collection of documents that describes the requirements, capabilities, limitations, design, operation, and maintenance of a system, such as a communications, computing, or information processing system.

system failure transfer: In the event of a catastrophic failure, the ability to transfer central office trunks or interoffice trunking to predetermined stations to allow incoming and outgoing calls to be completed.

system follow-up: The study of the effects of a system after it has reached a stabilized state of operational

use. *Synonyms* **post-development review, post-implementation review.**

system generation (SYSGEN): The process of selecting optional parts of an operating system and of creating a particular operating system tailored to the requirements of a data processing installation.

system integration: The progressive linking and testing of system components to merge their functional and technical characteristics into a comprehensive, interoperable system. *Note:* Integration of data systems allows data existing on disparate systems to be shared or accessed across functional or system boundaries.

system integrity: 1. That condition of a system wherein its mandated operational and technical parameters are within the prescribed limits. (188) **2.** [The] quality of an AIS when it performs its intended function in an unimpaired manner, free from deliberate or inadvertent unauthorized manipulation of the system. [NIS]

system lifecycle: The course of developmental changes through which a system passes from its conception to the termination of its use and subsequent salvage. *Note:* For example, a system lifecycle might include the phases and activities associated with the analysis, acquisition, design, development, test, integration, operation, maintenance, and modification of the system.

system loading: In a frequency-division multiplexed (FDM) transmission system, the absolute power level of the composite signal transmitted in one direction. (188) *Note 1:* The absolute power level is referred to a zero transmission level point (0TLP). *Note 2:* The composite signal contains signaling, speech, and digital signals.

system management: 1. Network management functions extended to include subscriber elements or user end instruments. (188) **2.** In computer systems, *synonym* **system administration.**

system operational threshold: For a supported performance parameter of a system, the value that establishes the minimum operational service performance level for the parameter. (188) *Note:* A measured parameter value worse than the system operational threshold indicates that the system is in an outage state.

system overhead information: *See* **overhead information.**

system power margin: *Synonym* **power margin.**

system reliability: The probability that a system, including all hardware, firmware, and software, will satisfactorily perform the task for which it was designed or intended, for a specified time and in a specified environment. [From Weik ’89]

system robustness: The measure or extent of the ability of a system, such as a computer, communications, data processing, or weapons system, to continue to function despite the existence of faults in its component subsystems or parts. *Note:* System performance may be diminished or otherwise altered until the faults are corrected.

systems analysis: *Synonym* **system analysis.**

systems control: In a communications system, the control and implementation of a set of functions that (a) prevent or eliminate degradation of any part of the system, (b) initiate immediate response to demands that are placed on the system, (c) respond to changes in the system to meet long range requirements, and (d) may include various subfunctions, such as (i) immediate circuit utilization actions, (ii) continuous control of circuit quality, (iii) continuous control of equipment performance, (iv) development of procedures for immediate repair, restoration, or replacement of facilities and equipment, (v) continuous liaison with system users and with representatives of other systems, and (vi) the provision of advice and assistance in system use. (188)

systems design: 1. A process of defining the hardware and software architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. **2.** The preparation of an assembly of methods, procedures, or techniques united by regulated interaction to form an organized whole. [JP1]

systems engineering: *See* **systems design.**

system signaling and supervision: In transmission systems, any scheme used to provide such functions as system control, addressing, routing, error detection and correction, level control, priority, traffic control, message accountability, and/or other required overhead information. (188)

system software: Application-independent software that supports the running of application software.

system standard: In the military community, the system-specific characteristics, not dictated by the individual components' electrical performance characteristics, but necessary in order to permit internal and external interoperability. (188)

system supervision: In telephone systems, the use of signals and techniques to perform system management functions, such as system control, addressing, routing, error detection and correction, level control, priority, traffic control, message accountability, and other overhead functions that may be described in system overhead portions of messages. [From Weik '89]

system support: The continued provision of services and material necessary for the use and improvement of a system during its lifecycle.

system test time: The part of operating time during which a functional unit is tested for proper operation. *Note:* In a computer, the system test time may include the time for testing programs belonging to the operating system.

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